امراض فم - رابع - اسنان

Oral Pathology

Biopsy

(Principles and Techniques)

Lec. 1

A systematic approach should be developed in evaluation a patient with an oral and maxillofacial lesions, which include the following steps:

- A detailed history
- Clinical Examination
  - Extraoral
  - Intraoral
- Special investigations : (as appropriate)
  - Radiography or other imaging techniques
  - Biopsy for histopathology (include immunoflourescence, Immunohistochemistry ,electron microscopy etc..)
  - Specimens for microbial cultures
  - Haematological or biochemical tests.

History :

- Demographic details (age , gender , occupation and address)
- History of the present complaint: history of the lesion including onset, duration, time course of any change in signs and symptoms, consider any pervious treatment and their effectiveness and if there is any associated symptoms as fever, nausea or anorexia.
- Additional questions to ask if needed: pain (if present and it's character) , abnormal sensation, anesthesia, dysphagia or bad taste or smell.
- Medical history: A medical history is important as it aids the diagnosis of oral manifestation of systemic disease. It ensures that medical condition and medication which affect dental or surgical treatment are identified. A detailed drug history is essential
- The basic medical condition that warrant special care include :-
  1. Bleeding tendencies
  2. Cardiorespiratory complaints
  3. Anemias and allergies

4. Immunocompromised patient
5. Drug treatment
6. Infections include (HIV / AIDS)
7. Poorly controlled diabetes mellitus
8. Likelyhood of or exsisting pregnancy

Clinical Examination of oral lesion:

- It should include the following when possible : inspection, palpation, percussion and auscultation
- Examine the physical characters of the lesion
- The anatomic site of the lesion
- The size, shape, color of lesion
- The surface texture and consistency of lesion
- Lymph node examination (lymphadenopathy is a common manifestation of infection but may also signify malignancy)

Imaging

- The most informative imaging techniques in the head and neck are radiography, computerized tomography (CT), magnetic resonance imaging (MRI) and ultrasound.
- The radiographs can provide clues that will help in determining the nature of lesion

Laboratory investigation

- Oral lesion may be manifestations of systemic diseases
- Example of these systemic condition: hyperparathyroidism, paget's disease, multiple myeloma
- Serum calcium, serum phosphorus, alkaline phosphatase and proteins determination can be very useful in exclusion of certain pathological conditions

Biopsy

Biopsy is the removal of a part or the whole of lesion for the purpose of diagnostic examination . There are several types of biopsy:-

1. Surgical biopsy:-
   - Incisional biopsy
   - Excisional biopsy
2. Oral cytology
3. Aspiration biopsy

Indication for Biopsy:

- Any lesion persists for more than 2 weeks with no apparent etiology basis.
- Any inflammatory lesion that does not respond to local treatment after 10 to 14 days (that is, after removing local irritant).
- Persistent hyperkeratosis changes in surface tissue (ex: lips or oral mucosa).
- Any persistent tumescence, either visible or palpable beneath relatively normal tissue.
- Lesion that interferes with local function (ex: fibroma).
- Bone lesions not specifically identified by clinical and radiographic finding.
- Any lesion that has the characteristics of malignancy.

Characteristics of lesions that raise the suspicion of malignancy:

- **Erythroplasia**—lesion is totally red or has speckled red appearance
- **Ulceration**—lesion is ulcerated or presents as an ulcer
- **Duration**— lesion has persisted more than 2 weeks
- **Growth rate**– lesion exhibits rapid growth
- **Bleeding**— lesion bleeds on gentle manipulation
- **Induration**– lesion and surrounding tissue is firm to the touch
- **Fixation**– lesion feels attached to adjacent structures

Instruments and Materials:

The instruments necessary for performing surgical biopsy of soft and hard tissues are the following:

* Local anesthesia syringe
* Scalpel handle and blade
* Surgical–anatomic forceps
* Hemostat
* Needle holder
* Curved scissors
* Suction tip
* Periosteal elevator
* Periapical curette
* Bone file

The materials considered necessary for biopsy are:

* Local anesthetic cartridge
* Needle for anesthesia
* Sutures
* Surgical dressing
* Gauze

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* Needle for anesthesia
* Sutures
* Surgical dressing
* Gauze

* Vial containing 10% formalin solution for placement of specimen.

As for **aspiration biopsy**, the necessary instruments and materials include the following:

* Trocar needle or a simple low gauge needle

* Plastic disposable syringe

* Glass slides

* Fixative material

Principles for Successful Outcome of oral soft tissue Biopsy

Oral soft tissue biopsy is a technique that every dentist should be competent to perform.

If performed properly, it is a simple and painless technique, the entire oral mucosa is amenable to biopsy

In order for the biopsy procedure to be successful, careful attention must be paid to the following:

- In clinically suspicious lesions, biopsy must be carried out as soon as possible.

- The choice of the biopsy technique to be employed is determined by the indications of each case.

- Block L/A should be used when possible & should never be directly injected into the lesion, because it can distort the specimen but When blocks are not possible, field infiltration technique can be employed

- The use of the electrosurgical blade is to be avoided, due to the resulting high temperature, which causes coagulation and destruction of tissues.

- Biopsies are often performed on mobile tissues (tongue, lip, soft palate, floor of mouth, buccal mucosa)

These tissues must be stabilized in order to accurately make incisions, dissect, etc.

Stabilization Methods

- Finger stabilization

- Retraction sutures

- Towel clips

Retractors

- Use of suction devices should be avoided because You may loose your specimen in the suction.

auze should be used to maintain a clean surgical field

ıction should only be used for significant hemorrhage

- The tissue specimen must not be grasped with forceps.

hen their use is necessary, though, the normal part of the removed tissue ould be grasped, once forceps are applied to the specimen, releasing and ıpplication should be avoided

- The tissue specimen taken should be representative.

- Immediately after its removal, the tissue specimen should be placed in a container with fixative. Keeping the tissue specimen outside of the container for a prolonged period dries the specimen, while there is a risk of it falling or being misplaced.

The fixative solution to be used is 10% formalin, and not water, alcohol, or other liquids that destroy the tissues& the tissue must be totally immersed in the solution

- It is recommended that the container to be sent to the laboratory is plastic to avoid risk of breakage during its transfer and subsequent loss of the specimen.

- The label with the name of the patient and date should be placed on the side of the container, and not on the lid. This way the possibility of mix-up at the laboratory after opening is avoided.

Excisional Biopsy:

This technique entails removal of the entire lesion, along with a border of normal tissues surrounding the lesion. The indications for employing excisional biopsy are the following:

- Small lesions, whose size ranges from a few millimeters to one or two centimeters.
- Specific clinical indications that the lesion is benign.
- The surgical procedure may be performed at the dental clinic with the usual armamentarium and if the operation is within the scope of the general practitioner.

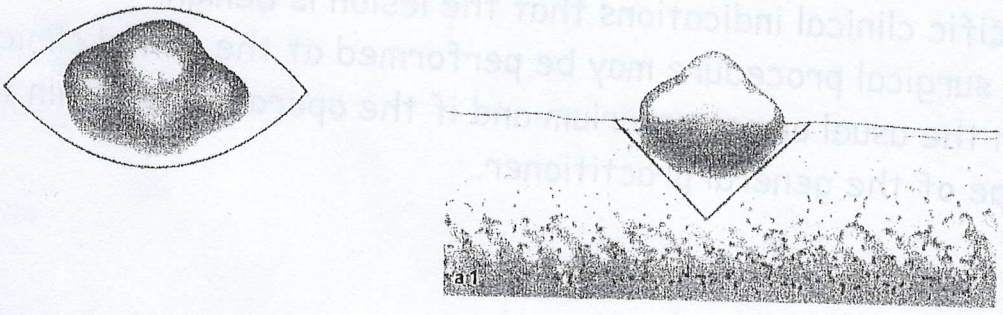
Generally, the procedure for performing the biopsy is as follows:

After administration of local anesthesia, which is performed at the periphery of the lesion and not directly inside the lesion, two elliptical incisions are made on normal tissue surrounding the lesion, which are joined at an acute angle.

The lesion is then removed, the mucosa is undermined using blunt scissors, and the wound margins are re approximated, suturing is performed, and healing is achieved by primary intention (figure 1).

If the lesion is located at the gingiva or palate, suturing is not possible. In such a case, a surgical dressing is applied and the wound heals by secondary intention.

It is recommended that the lesion be grasped at its base using forceps or a suture. If the lesion were to be grasped at the center and not at its base, the histological presentation could be altered and could cause problems in diagnosis.



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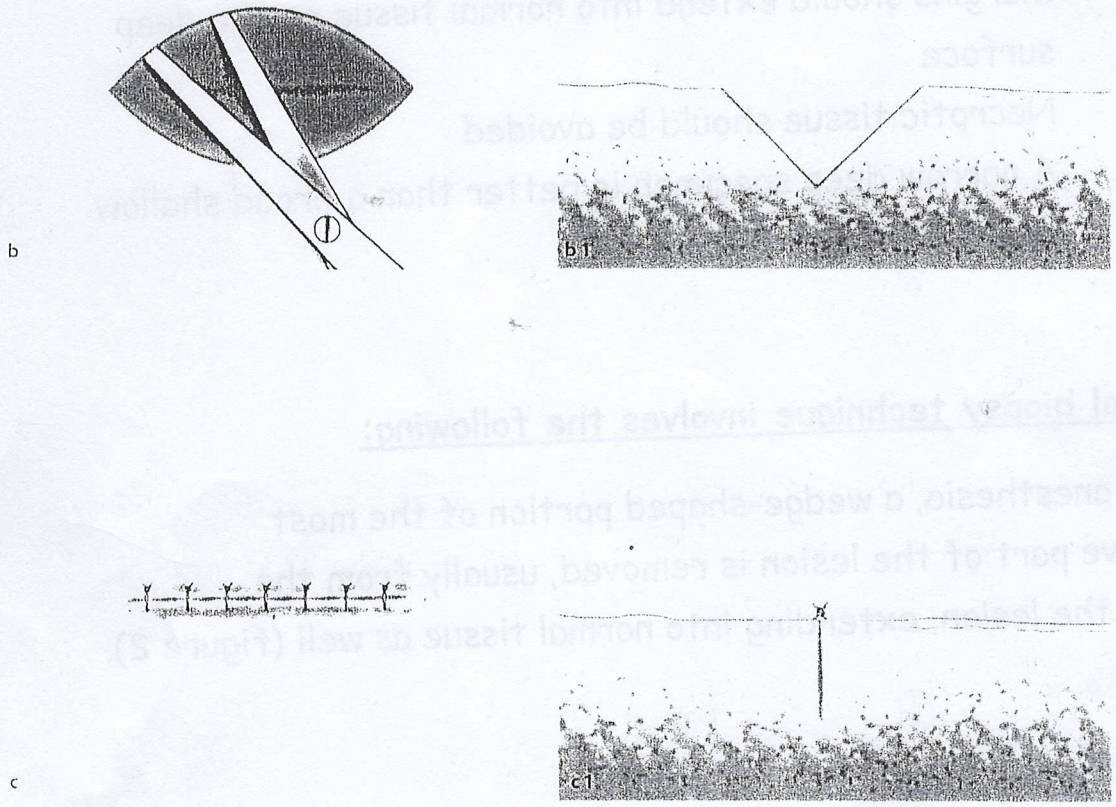


Figure 1: a–c. Diagrammatic representation of excisional biopsy technique. a Incision around lesion. b Blunt undermining of mucosa of wound margins after removal of lesion. c Operation site after suturing. a1, b1, c1 Steps correspond to a, b, c, in a vertical cross-sectional view

Incisional biopsy:

Incisional biopsy involves removal of only a portion of a relatively more extensive lesion, so that histopathological examination may be performed and a diagnosis made.

Indications:

1- In cases where the lesion is larger than 1 or 2 cm

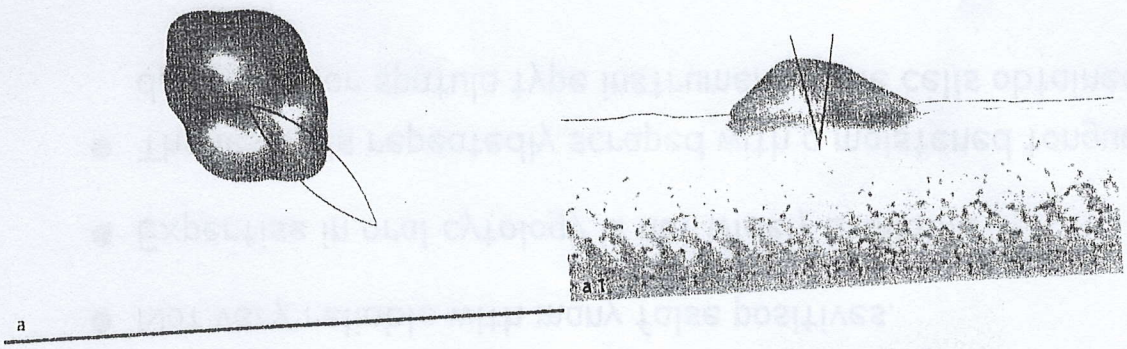
2- When there is suspicion that the lesion is malignant.

Technique:

- Representative areas are biopsied in a wedge fasion
- Margins should extend into normal tissue on the deep surface
- Necrotic tissue should be avoided
- A narrow deep specimen is better than a broad shallow one.

The incisional biopsy technique involves the following:

After local anesthesia, a wedge-shaped portion of the most epresentative part of the lesion is removed, usually from the eriphery of the lesion, extending into normal tissue as well (figure 2).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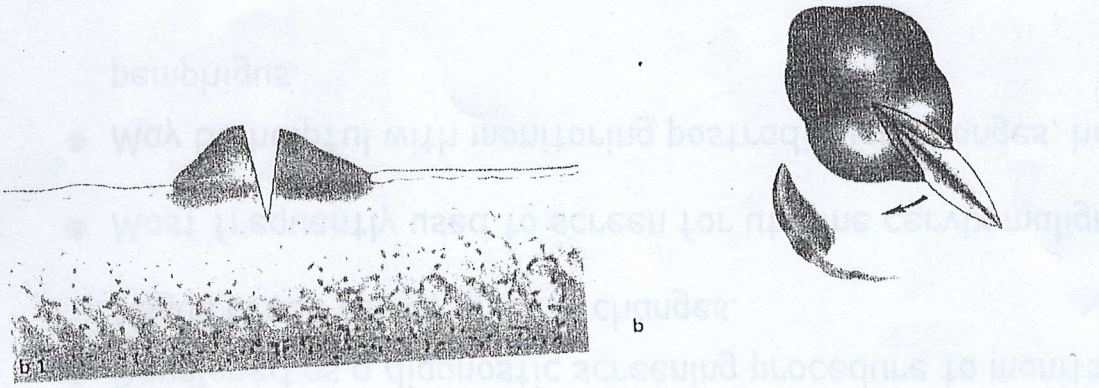
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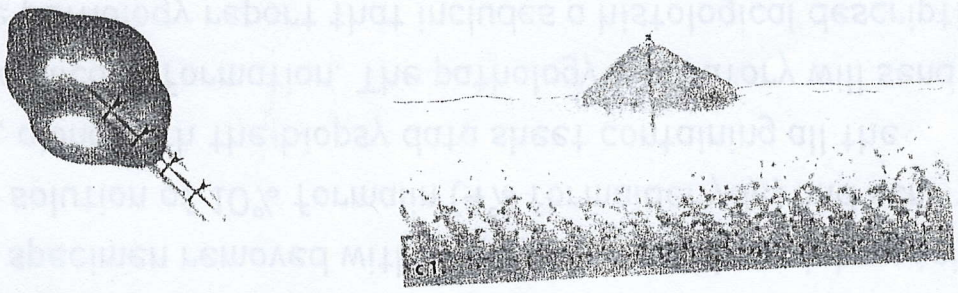
c
c1

Figure 2 : a-c. Diagrammatic representation of incisional biopsy technique. a Demarcation of incision. b Surgical field after removal of specimen. c Operation site after suturing. a1, b1, c1 Steps correspond to a, b, c, in vertical cross-sectional view

Specimen Care

The tissue specimen removed with biopsy is placed in a vial containing an aqueous solution of 10% formalin (4% formaldehyde) and sent to the laboratory, along with the biopsy data sheet containing all the necessary clinical information. The pathology laboratory will send the dentist the pathology report that includes a histological description and diagnosis.

Oral Cytology

- Developed as a diagnostic screening procedure to monitor large tissue areas for dysplastic changes.
- Most frequently used to screen for uterine cervix malignancy
- May be helpful with monitoring postradiation changes, herpes, pemphigus.

The Disadvantage of oral cytological procedures include:

- Not very reliable with many false positives.
- Expertise in oral cytology is not widely available
- The lesion is repeatedly scraped with a moistened tongue depressor or spatula type instrument. The cells obtained are

smeared on a glass slide and immediately fixed with a fixative spray or solution

Fine Needle Aspiration biopsy

- Aspiration biopsy is the use of a needle and syringe to penetrate a lesion for aspiration if its contents.
- Indications:
  - To determine the presents of fluid within a lesion
  - To a certain the type of fluid within a lesion
  - When exploration of an intraosseous lesion is indicated

Advantages of FNA biopsy:

- The technique is relatively painless.
- A diagnosis may be available within 1 hour.
- The procedure is relatively inexpensive.
- The method provides useful information for the preoperative or pretreatment investigation of pathological processes.
- It is not technically demanding.
- Complications from the procedure are relatively rare

Limitations of FNA biopsy:

Include the facts that the:

- sample may not be technically adequate
- the sample may not be representative of the lesion

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- Palpation of the area of the lesion with comparison to the opposite side.
- Any radiolucent lesion should have an aspiration biopsy performed prior to surgical exploration.
    - Information from the aspiration will provide valuable information about the lesion.
        - Solid
        - Fluid Filled
        - Vascular
        - Without Contents

Principles of Surgery

- Mucperiosteal flaps should be designed to allow adequate access for incisional/excisional biopsy.
- Incisions should be over sound bone
- Cortical perforation must be considered when designing flaps
- Flaps should be full thickness
- Major neurovascular structures should be avoided
- Osseous windows should be submitted with the specimen
- Osseous preformations can be enlarged to gain access
- Avoid roots and neurovascular structures

- The tissue consistency and nature of the lesion will determine the ease of removal
- Incisional biopsies only require removal of a section of tissue
- Soft tissue overlying the lesion should be reapproximated following thorough irrigation of the operative site.
- The specimen should be handled as previously described

When To Refer For Biopsy:

- When the health of the patient requires special management that the dentist feel unprepared to handle
- The size and surgical difficulty is beyond the level of skill that the dentist feels he/she possesses
- If the dentist is concerned about the possibility of malignancy

Oral pathology

Disorders of the dental pulp (pulp diseases, pulpitis)

The most significant diagnostic problem that the dentists may face in their practice is to determine the extent of the pulp disease that has taken place within a symptomatic (painful) tooth.

An evaluation of the damage to the pulpal tissue is essential, since the pulp can neither be seen nor touched, an indirect assessment is required.

Inflammation is the single most important disease process affecting the dental pulp and accounts for virtually all pulpal diseases of any clinical significance. The decision to be made by the dentist based on clinical assessment of the pattern of pulp inflammation (pulpitis) is one of three:-

1- To restore the defective tooth structure ((conservative)).
2- To remove the pulp tissue ((endodontic)).
3- To remove the entire tooth.

In making such a decision, the clinician should decide whether the pulp damage ((pulpitis)) is reversible or irreversible pulpitis.

Pulpitis

The dental pulp is a delicate connective tissue, containing tiny blood vessels, lymphatic, myelinated, unmyelinated nerves, and undifferentiated mesenchymal cells like other connective tissues throughout the body; it reacts to noxious stimuli by an inflammatory response. This response is not significantly different from that seen in other tissues, the final result can be different because of certain peculiar (anatomical) features of the pulp which includes:-

1-the pulp is enclosed within the calcified walls of the dentin, which precludes the excessive swelling of the tissue that occurs in hyperemic and edematous phases of inflammation in other tissues.

2-the blood vessels supplying the pulp tissues must enter the tooth through a tiny apical foramen, this precludes the development of an extensive collateral blood supply to the inflamed part.

Causes of pulpitis:-

1- Bacterial-caries in crown, periodontal pockets.
2- Traumatic-crown fractures, root fractures, partial avulsion, bruxism, abrasion.
3- Iatrogenic - Chemical -Thermal.

Heat generation, depth of preparation, dehydration of tubules, pulp exposure, and volatile/toxic disinfectant filling materials. Of these causes, the bacterial effects are the most important.

Bacteria can damage the pulp through toxins or directly after extension from caries or transportation via the vasculature ((this is a debatable issue))

Barotrauma (aerodontalgia)

Dental pain has been described by air crew flying at high altitudes in unpressurized aircraft. And in divers subjected to too rapid decompression following deep sea diving. This pain has been attributed to the formation of nitrogen bubbles in the pulp tissues or vessels, similar to the decompression syndrome elsewhere in the body, however, gas bubbles are seldom found in decompressed organs and the possibility of fat emboli from altered lipoproteins and platelet thrombi around the fat is suggested by some investigators. Aerodontalgia is really a marker of inadequate pulp protection from the atmosphere and this usually means caries. It is not a direct cause of pulpitis, rather an exacerbating factor

Pulpitis can be classified as

- Acute or chronic
- Subtotal or generalized
- Infected or sterile

The best classification system is one that guides the appropriate treatment ((1 of the 3 choices))

Reversible pulpitis denotes a level of pulpal inflammation in which the tissue is capable of returning to a normal state of health if the noxious stimuli are removed.

Irreversible pulpitis implies that a higher level of inflammation has developed in which the dental pulp has been damaged beyond the point of recovery

When external stimuli reach a noxious level, degranulation of mast cells, decreased nutrient flow and cellular damage occur. Numerous inflammatory mediators (histamine, bradykinin, and prostaglandins) are released. These mediators cause vasodilation, increased blood flow, and vascular leakage with edema. Normally this should promote healing through removal of inflammatory mediators. However, the dental pulp exists in a very confined area.

If the inflammatory process continued for an extended period of time can lead to increased pulp injury or even death of the pulp.

Previous studies suggested that the associated increased vascular pulpal pressures could compress venous return and lead to (self-strangulation) and pulp necrosis.

Recent studies recognize that the associated increased vascular pulpal pressures could compress venous return and lead to (self-strangulation) and pulp necrosis.

Recent studies recognize that the increased fluid pressure usually is localized to the area of inflamed pulp immediately adjacent to the affected dentin, increased

interstitial pressure in area of inflammation leads to increased flow of fluid back into capillaries of adjacent uninflammed tissue and increased drainage. In this manner, the increased fluid pressure from inflammation is counteracted and typically does not lead to generalized increase in pulp fluid pressure, effectively preventing (self-strangulation).

According to the above mentioned explanation of the pulp response to injury, it seems that the pulp defense mechanisms may work well with many mild-moderate injuries and rarely result in widespread necrosis. Localized pulp abscesses may heal after eliminating the injury and formation of reparative dentin, however sever localized pulpal damage can overwhelm the system, leading to pulp necrosis.

1-Reversible pulpitis (focal reversible pulpitis)

This denotes that the pulp is capable of full recovery if the irritating factors subside or removed.

The symptoms reflect an irritated pulp tissue that reacts with the mildest and earliest forms of the inflammatory response, consisting of vasodilation, transudation, a slight infiltrate of acute inflammatory cells underlying the area of affected dentinal tubules. Tertiary dentin may be noted in the adjacent wall.

On clinical examination the pain is mild-moderate in intensity and responds to sudden change in temperature. The pain generally remains for 5-10 minutes and seldom lasts longer than 20 minutes. The tooth remains symptomless until it is stimulated again. Changing body positions do not affect the pattern of pain, or duration of pain. The pain is mostly provoked by cold, although hot, sweet, or sour food may also cause pain.

The tooth responds to electric pulp testing at lower levels of current than normal tooth. Percussion and mobility tests are negative. If the tooth is treated, the

condition is reversible and the pulp will heal, if pulpitis is allowed to progress, then irreversible pulp damage will occur.

2-Irreversible pulpitis

The patient with early irreversible pulpitis presented with sharp, sever pain on thermal stimulation, and the pain continues after removal of the stimulus. Cold is the most uncomfortable, although heat or sweet and acidic food can cause pain. The pain may be spontaneous or continuous and may be exacerbated when the patient lies down. The tooth responds to electric pulp testing at lower levels of current. At this stage (early), the pain often can be localized easily to the individual affected tooth. With time the patient discomfort is increasing and can no more be able to identify the offending tooth

In the later stages of irreversible pulpitis, the Pain increases in intensity and experienced as throbbing, which keeps the patient awake at night. At this point heat increases the pain, while cold may produce relief. The tooth responds to electric pulp testing at higher levels of current or demonstrates no response. Mobility and sensitivity to percussion are negative.

Histopathological features of irreversible pulpitis

Irreversible pulpitis often demonstrates congestion of the venules that results in focal necrosis. This necrotic zone contains polymorphonuclear leukocytes and histiocytes. The surrounding pulp exhibits fibrosis and a mixture of plasma cells, lymphocytes and histeocytes.

3-Chronic hyperplastic pulpitis

This is a unique pattern of pulpal inflammation, it occurs in children and young adults who have large exposures of the pulp in which the entire dentinal roof often

is missing. The most frequently involved teeth are the deciduous or permanent molars, which have large pulp chambers in these age groups. Mechanical irritation and bacterial result in a level of chronic inflammation that produces hyperplastic granulation tissue that extrudes from pulp chamber and often fills the associated dentinal defect. The apex may be open and reduces the chance of pulp necrosis secondary to venous compression. The tooth is asymptomatic except for a feeling of pressure on mastication.

Histopathological features of chronic hyperplastic pulpitis

This demonstrates a cap of subacutely inflamed granulation tissue that fills the entire space of the original pulp chamber. The surface of the polyp may or may not be covered with stratified squamous epithelium, which migrates from the adjacent gingiva or arise from sloughed epithelium within the oral fluids. The deeper pulp tissue within the canals typically demonstrates fibrosis and chronic inflammation.

The process of irreversible pulpitis may be acute or chronic pulpitis.

Acute pulpitis-this may be a progression of focal reversible pulpitis or may present as an acute exacerbation of an already established chronic pulpitis. Pulpal damage may range in severity from simple acute inflammation marked by vessels dilatation, exudation and neutrophil chemotaxsis to focal liquefaction necrosis (pulp abscess) to total pulp suppurative necrosis.

Chronic pulpitis-this is an inflammatory reaction that results from long term low grade injury or occasionally from quiescence of an acute process symptoms, characteristically mild and often intermittent, appear over an extended period. A dull pain may be the presenting complaint, or the patient may have no symptoms. As the pulp becomes necrotic, responses to thermal and electric stimuli are reduced.

Histopathological features

Lymphocytes, plasma cells and fibrosis appear in the chronically inflamed pulp. If there is an acute exacerbation of chronic process, neutrophils will be seen.

Pulp necrosis

Pulp necrosis may follow either pulpitis or a traumatic injury to the apical blood vessels cutting off the blood supply to the pulp. A coagulative type of necrosis is seen after ischemia; trauma and the patient usually have no symptoms. If the necrosis follows pulpitis then breakdown of the inflammatory cells may lead to liquefactive type of necrosis which may become infected by bacteria from caries, this type is usually associated with foul odour when opened with endodontic treatment.

Diagnosis of pulp pain

The diagnostic procedures that are commonly used to assess the status of a symptomatic tooth and pulp are as follows.

1-history and nature of pain.

2-visual clinical examination.

3-reaction to thermal changes.

4-reaction to electric stimulation.

5-reaction to tooth percussion.

6-radiographic examination.

7-palpation of the surrounding area.

The diagnosis of pulp pain (pulpalgia) is made from a combination of all the above mentioned points. The value of these tests is sometimes less than optimal for e.g.

when the procedures demonstrate that the pulp is disease free, the results are highly reliable. However, when a pulp appears to test positive for irreversible pulpitis, the histopathological examination may demonstrate no obvious evidence of pulp disease.

For this reason the entire test available should be used to reach a diagnosis aided by the personal judgment and experience of the dentist.

If no correlation is existed between the symptoms present and the clinical examination, then this should raise the suspicion that these symptoms may not be of pulp origin, or the tooth that is the source of pain may be difficult to identify. Although pulpal pain never crosses the midline, it can be referred from arch to arch making pulp testing of both arches a necessity in difficult cases.

Numerous disorders have been reported to mimic pulpalgia, e.g. migraine, headache, myofacial pain and angina pectoris. If these conditions are not considered then the results would be sequential extractions or endodontic treatment which is all not needed and inappropriate.

Treatment and prognosis:-

Reversible pulpitis--- removal and elimination of the cause, on occasion analgesics are required. Prognosis is good if action taken early. Pulp testing is essential periodically to ensure that irreversible damage has not occurred.

Irreversible pulpitis---both acute, chronic, chronic hyperplastic are treated by endodontic treatment or extraction

Pulp calcification

Pulp stones (or denticles) are calcified bodies with an organic matrix and occur most frequently in the coronal pulp, true pulp stones contain tubules (albeit scanty and irregular). And may have an outer layer of predentine and adjacent odontoblasts. False

pulp stones are composed of concentric layers of calcified material with no tubular structure. According to their location in the pulp stones may be described as free, adherent, or interstitial when they have become surrounded by reactionary or secondary dentine, pulp stones increases in number and size with age and are apparently more numerous after operative procedures on the tooth, when large they may be recognized on radiographs. They do not cause symptoms. Although neuralgic pain has sometimes been attributed to their presence.

Dystrophic calcifications in the pulp consist of granules of amorphous calcific material which may be scattered along collagen fibers or aggregated into larger masses. They are most commonly found in the root canals. Dystrophic calcifications and pulp stones may obstruct endodontic therapy. Pulp calcification may follow traumatic injury to the apical blood vessels which are not sufficient to cause pulp necrosis. Large quantities of irregular dentine form in the pulp chamber and root canals which become obliterated. Pulp obliteration is also seen in dentinogenesis imperfect and dentinal dysplasia.

Age changes in the pulp

The volume of the pulp gradually decreases with the age due to the continued production of secondary dentine, decreased vascularity, reduction in cellularity and increase in collagen fiber content have been reported, and these changes may impair the response of the tissue to injury and its healing potential.

It is generally accepted that the prevalence of the pulp stones and diffuse calcification increase with age but the evidence for this is inconclusive.

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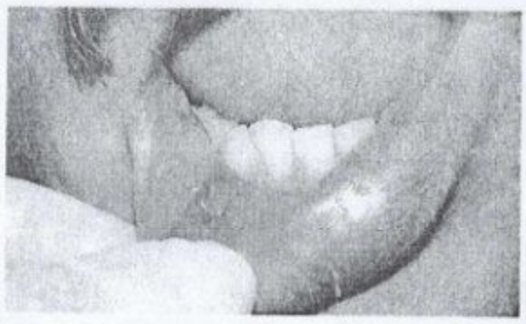
Aphthus Ulcer



- Aphthous ulcer is the most common type of nontraumatic, ulcerative condition of the oral mucosa. The exact etiology is not known and only few probable factors have been identified which are as follows
- Genetic predisposition
- Exaggerated response to trauma
- Immunological factors
- Microbiologic factors
- Nutritional factors
- Systemic conditions
- Hormonal imbalance
- Allergy
- Stress and anxiety

Clinical Features:

- Onset frequently in childhood but peak in adolescence or early adult life
- Attacks at variable but sometimes relatively regular intervals
- Most patients are bookkeeping, semiprofessional or professional workers; and are mostly nonsmokers.

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- Usually self-limiting eventually
- Before the appearance of the ulcer, the involved area produces a burning or tingling sensation, but the ulcers are never preceded by vesiculations.

تَحَوصُل

TYPES

Clinically aphthous ulcers present three recognizable forms, namely:

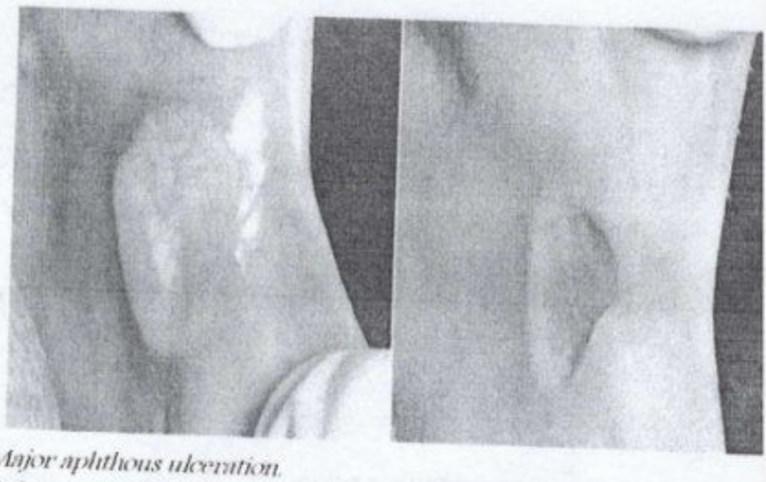
A. Minor aphthous ulcers;
B. Major aphthous ulcers;
C. Herpetiform ulcers.

1-Minor aphthous ulcers

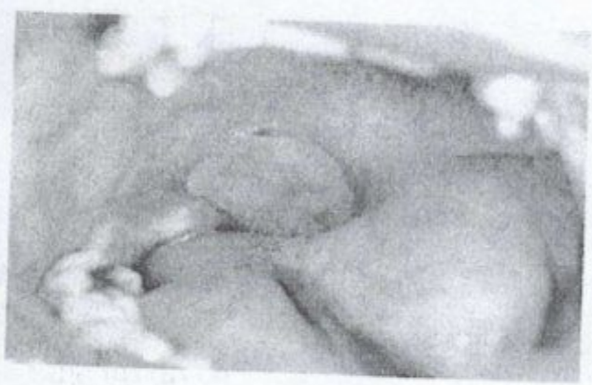
- The most common type
- Non-keratinised mucosa mostly affected
- Ulcers are shallow, rounded, 5–7 mm across, with an erythematous margin and yellowish floor
- One or several ulcers may be present

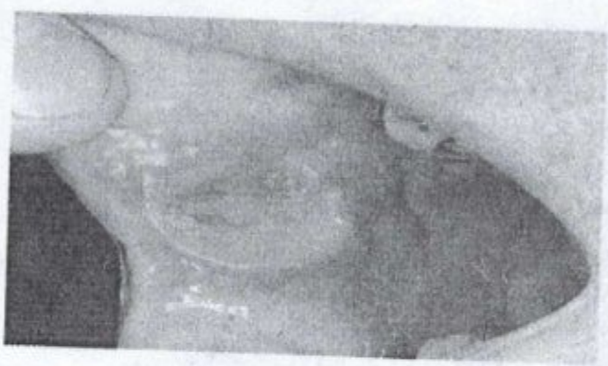
2-Major aphthous ulcer

- Major aphthous ulcers are less common than the minor form of the disease
- Ulcers frequently several centimetres across
- Sometimes mimic a malignant ulcer
- Ulcers persist for several months
- Masticatory mucosa such as the dorsum of the tongue or occasionally the gingivae may be involved
- Scarring may follow healing



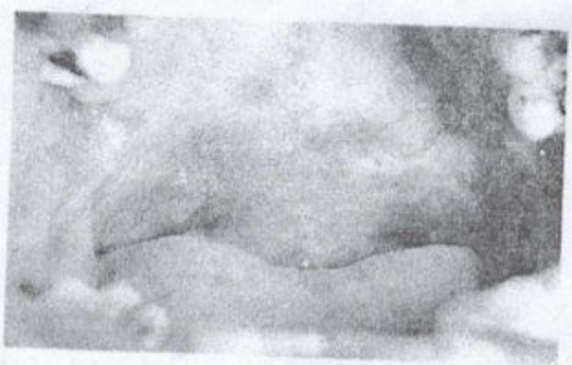
Major aphthous ulceration.
A. Large ulceration of the left anterior buccal mucosa.
B. Same lesion after 5 days of therapy with betamethasone syrup. The ulceration healed completely during the following week.





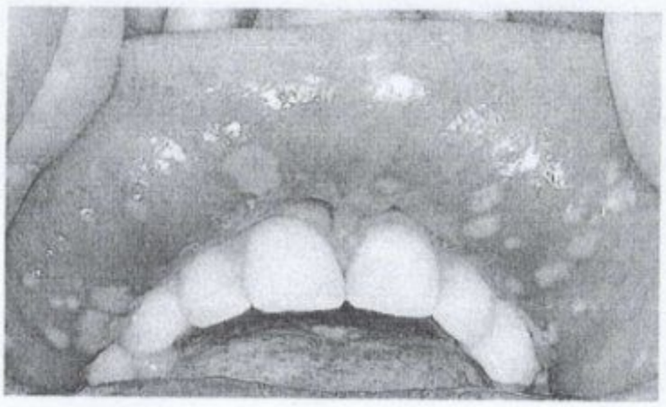
Herpetiform aphthae

- Herpetiform type of aphthous ulcers produce recurrent crops of extremely painful, small ulcers in the oral mucosa, which resemble herpetic ulcers. However, these ulcers do not develop following vesiculations and exhibit no virus infected cells.
- Non-keratinised mucosa affected
- Ulcers are 1–2 mm across
- Dozens or hundreds may be present
- May coalesce to form irregular ulcers
- Widespread bright erythema round the ulcers
- The ulcers last for several weeks or months (duration is much longer then the other two types)



Herpetiform aphthous ulcers. The patient also had numerous lesions of the lip and buccal mucosa.

Histopathology



- Because the diagnosis of these ulcers is usually evident clinically, biopsies usually are unnecessary and therefore are rarely performed.
- Aphthous ulcers have nonspecific microscopic findings, and no histologic features are diagnostic.
- Aphthous ulcer microscopically shows the presence of an overlying degenerated and ulcerated epithelium being covered by a fibrinopurulent exudates.
- Vacuolization and necrosis of the individual epithelial cells occur.
- In the underlying connective tissue, dense infiltration of neutrophils are found in the superficial layer.
- In the deeper layers of connective tissue lymphocytes, macrophages, plasma cells and mast cells, etc

تَشَكُّلُ الفَجَوات

Preaphthous ulceration. Intense lymphocytic infiltrate and basilar epithelial edema seen in pre ulcerative stage of an aphthous lesion.

Aphthous ulcer showing nonspecific changes.

Differential Diagnosis:

- Diagnosis of aphthous ulcers is generally based on the history and clinical appearance.
- Lesions of secondary (recurrent) oral herpes are often confused with, but usually can be distinguished from, aphthous ulcers.
- A history of vesicles preceding ulcers, location on the attached gingiva and hard palate, and crops of lesions indicate herpetic rather than aphthous ulcers.
- Other painful oral ulcerative conditions that may simulate the various forms of aphthous ulcers include trauma, pemphigus vulgaris, mucous membrane pemphigoid, and neutropenia.

Treatment

- In patients with occasional or few minor aphthous ulcers, usually no treatment is needed apart from a bland mouth rinse in warm water to keep the mouth clean.
- However, when patients are more severely affected, some forms of treatment can provide significant control (but not necessarily a cure) of this disease.

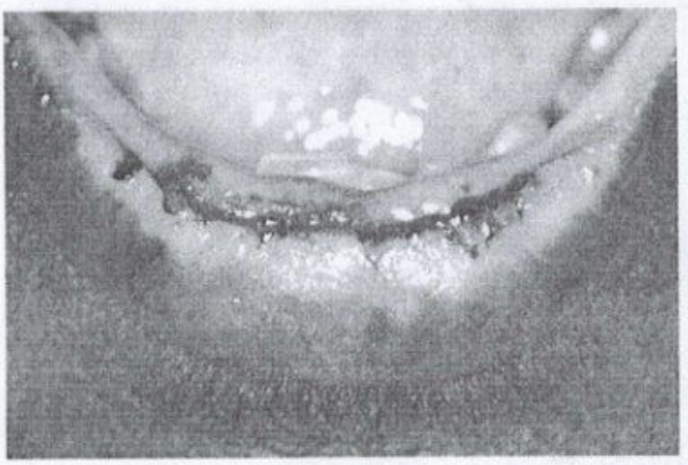
Erythema Multiforme

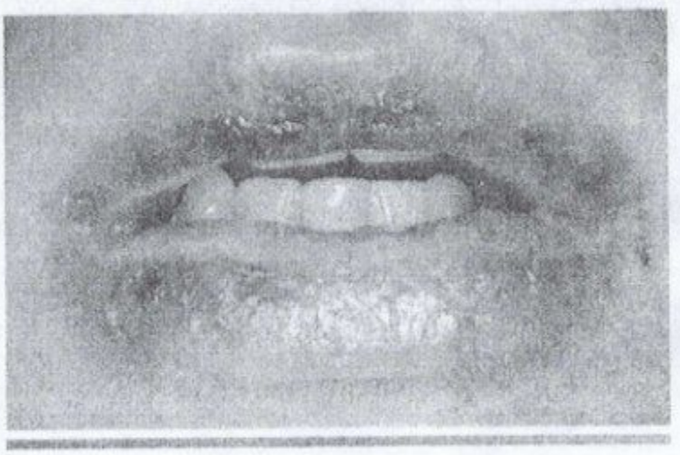
__(EM) is an acute self-limiting hypersensitivity reaction characterized by target skin lesions and/or ulcerative oral lesions.

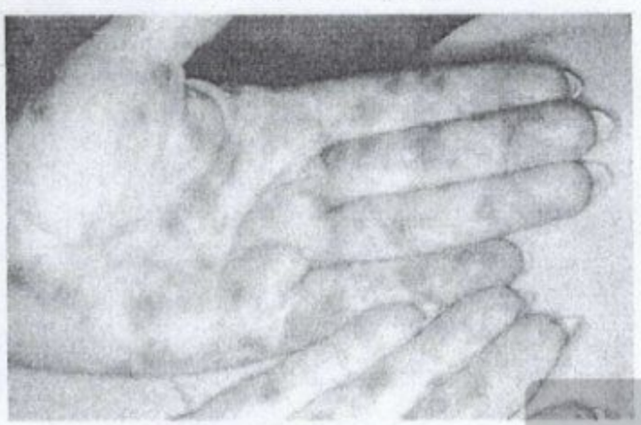
• Adolescents or young adults mainly affected.

• Mild fever and systemic upset may be associated

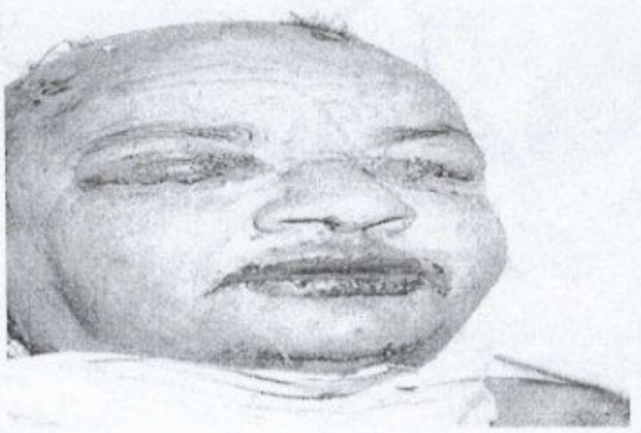
• Lips frequently affected and clinically may swollen, split, crusted and bleeding (EM) divided into two subtypes: a **minor form**, usually associated with an **HSV trigger**, and a **major (Stevens-Johnson syndrome**)severe form, triggered by **certain systemic drugs.**





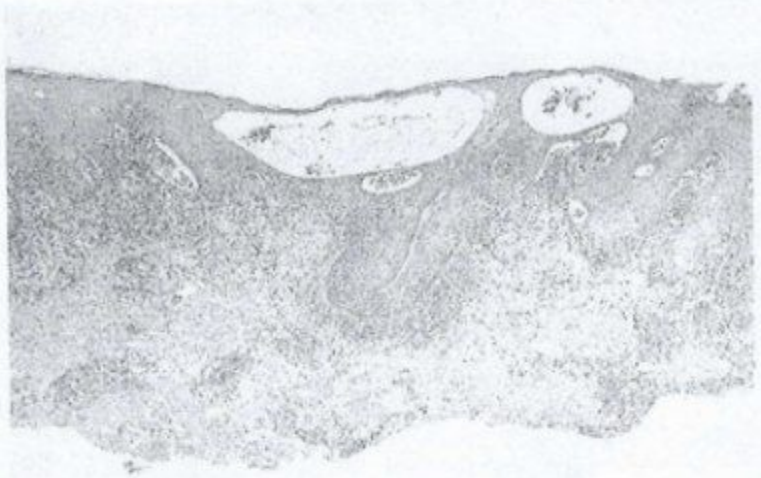


Erythema multiforme.



Stevens-Johnson syndrome. Extensive patchy sloughing mucositis following administration of antibiotics.

Histopathology.



- The microscopic pattern of EM consists of epithelial hyperplasia and spongiosis. Basal and parabasal apoptotic keratinocytes are usually seen. Vesicles occur at the epithelium–connective tissue interface, although intraepithelial vesiculation may be seen.
- Epithelial necrosis is a frequent finding. Connective tissue changes usually appear as infiltrates of lymphocytes and macrophages in perivascular spaces and in connective tissue papillae

Treatment

- In EM minor, symptomatic treatment, including keeping the mouth clean with bland mouth rinses, may be all that is necessary. In EM major, topical corticosteroids may help control disease. The use of systemic corticosteroids remains controversial and is believed by some to be contraindicated, particularly as maintenance therapy

مُلَطِّف

- If evidence of trigger is viral infection, systemic antiviral drugs during the disease may help
- Supportive measures, such as oral irrigation, adequate fluid intake, and use of antipyretics, may provide patients with substantial benefit.

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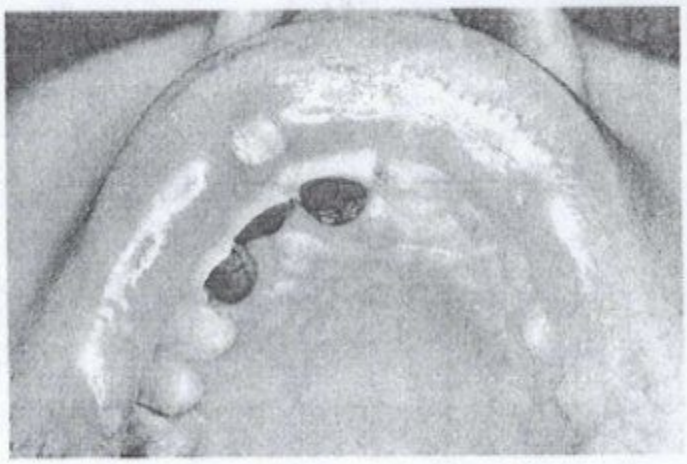
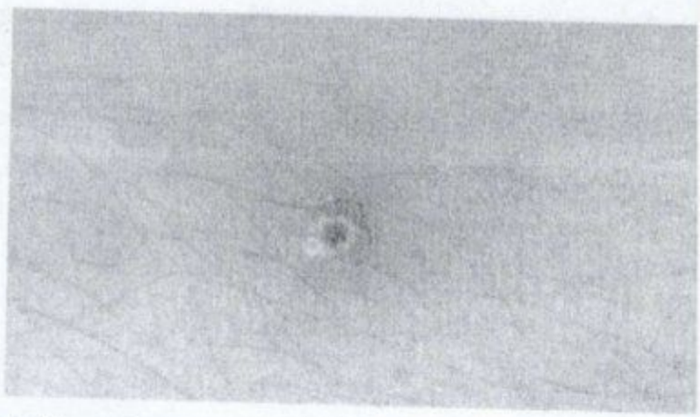
كَبِير

Behçet's Syndrome



- Behçet's syndrome is a rare multisystem inflammatory disease (gastrointestinal, cardiovascular, ocular, CNS, articular, pulmonary, dermal) in which recurrent oral aphthae are a consistent feature. The cause is un known .
- Although the **oral manifestations** are usually relatively minor, involvement of other sites, especially the eyes and CNS, can be serious.
- Clinical Features: Lesions of Behçet's syndrome **typically affect the oral cavity** (100% incidence), the **genitalia** (62% of cases), and **the eyes**. Other regions or systems are less commonly involved. Recurrent arthritis of the

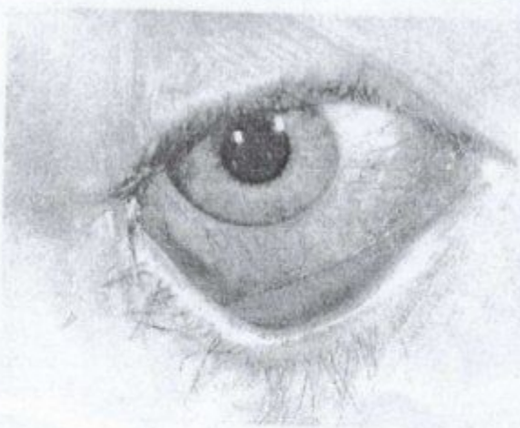
wrists, ankles, and knees may be associated. Cardiovascular manifestations are believed to result from vasculitis and thrombosis



Behcet 's syndrome
Sterile pustule of the skin that developed 1 day after injection of saline. This reaction is termed cutaneous pathergy.

Diagnosis

- The diagnosis of Behçet's syndrome is based on clinical signs and symptoms associated with the various regions affected. **Sterile pustule of the skin that developed 1 day after injection of saline. This reaction is termed cutaneous pathergy.** No specific findings are noted in biopsy tissue, and no supportive laboratory tests are available. eye examinations, and skin tests may aid in diagnosis



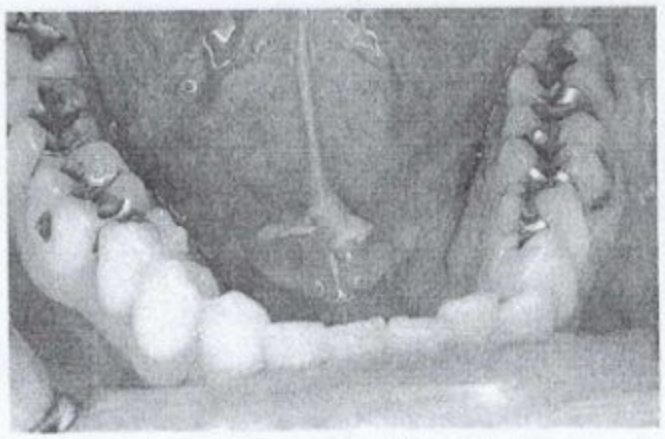
Treatment

No standard therapy is known for Behçet's syndrome. Systemic steroids are often prescribed

Traumatic Ulcerations

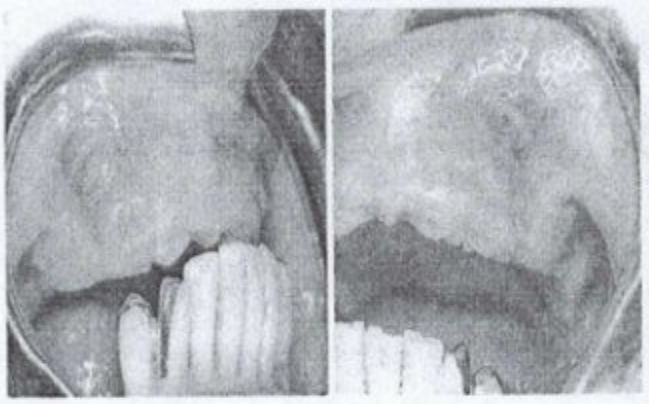
- Etiology. Ulcers are the most common oral soft tissue lesions. Most are caused by simple mechanical trauma, and a cause-and-effect relationship is usually obvious. Many are a result of accidental trauma and generally appear in regions that are readily trapped or abraded between the teeth, such as the lower lip, tongue, and buccal mucosa.
- Prostheses, most commonly dentures, are frequently associated with traumatic ulcers, which may be acute or chronic.

- Traumatic oral ulcers may also be iatrogenic (induced inadvertently by a health care practitioner, by medical treatment, or by diagnostic procedures).
- Naturally, respect for the fragility of oral soft tissues is of paramount importance in the treatment of dental patients. Overzealous tissue manipulation or concentration on treating primarily hard tissues may result in accidental, and avoidable, soft tissue injury. Ulcers induced by the removal of adherent cotton rolls, by the negative pressure of a saliva ejector, or by accidental

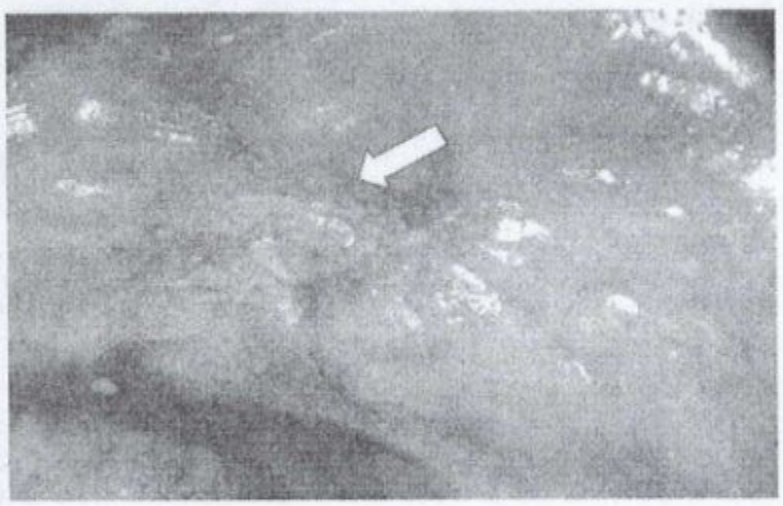


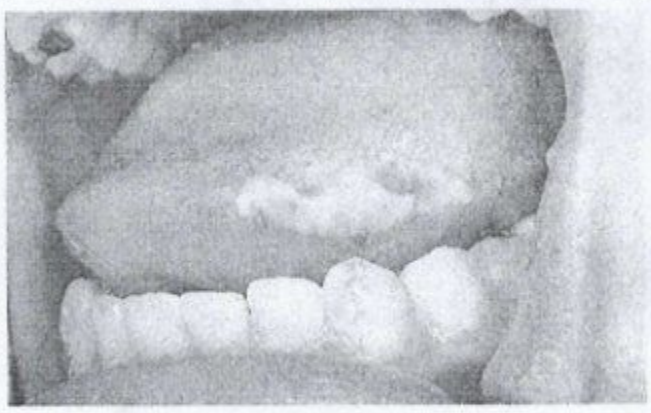
Ulcers and erythema caused by a denture flange.

Ulcer associated with excessive heat from hydrocolloid impression material.

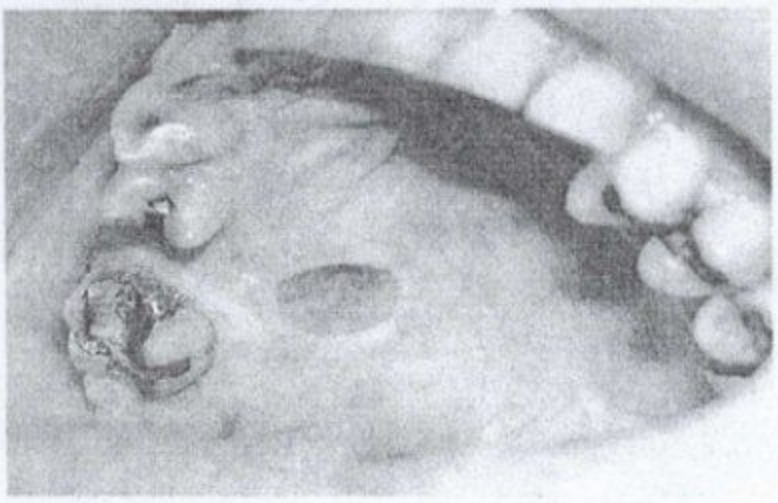


Anesthesia-associated acute tongue ulcer.





Chronic ulcer of the palate.



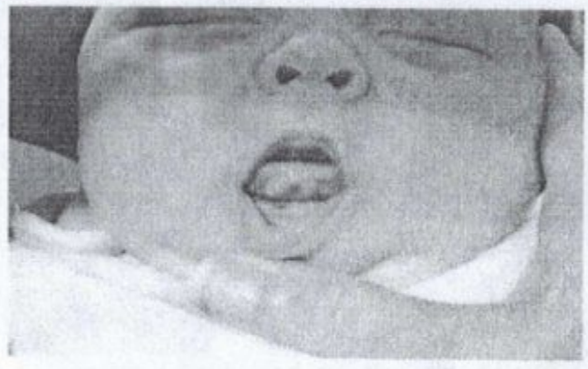
Chronic ulcer of the lateral tongue.

Histopathology

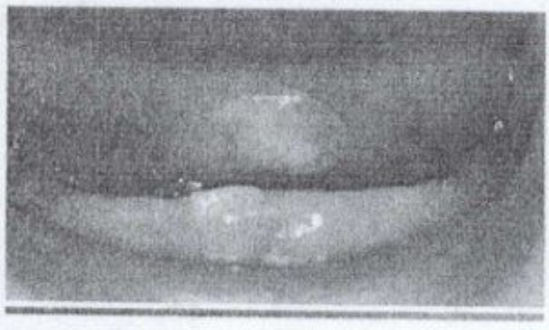
- Acute ulcers show loss of surface epithelium that is replaced by a fibrin network containing predominantly neutrophils. The ulcer base contains dilated capillaries and, over time, granulation tissue. Regeneration of the epithelium begins at the ulcer margins, with proliferating cells moving over the granulation tissue base and under the fibrin clot.

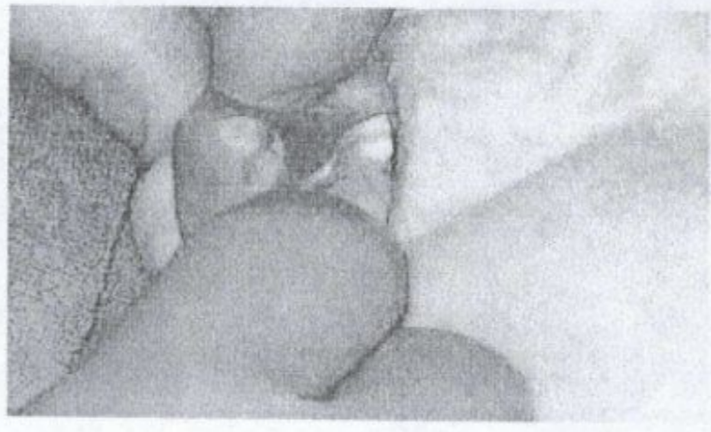
Riga-Fede

- *A traumatic ulcer in the anterior portion of the tongue of infants with natal teeth.* It may occur in as a result of chronic mucosal trauma from adjacent anterior primary teeth, often associated with nursing



Riga-Fede disease. Newborn with traumatic ulceration of anterior ventral surface of the tongue. Mucosal damage occurred from contact of tongue with adjacent tooth during breast feeding.





Treatment

- Most reactive ulcers of oral mucous membranes are simply observed. If pain is considerable, topical treatment may be beneficial, such as in the form of a topical corticosteroid. Healing of traumatic granuloma is spontaneous, but topical and intralesional steroids can accelerate healing and reduce symptoms.

Oral pathology

Oral mucosal lesions

The oral cavity is lined by a membrane composed of stratified squamous epithelium. This epithelium serves as a cover for the oral soft tissues as a barrier to the entry of external pathogenic factors. Depending on the intraoral site, the stratified squamous epithelium may be non-keratinized, orthokeratinized or parakeratinized.

Knowledge of clinical aspects of oral mucosal diseases must be correlated with oral anatomy. E.g. recurrent aphthous stomatitis occurs primarily on the nonkeratinized mucosa, whereas recurrent herpes simplex infections occur almost exclusively on the keratinized mucosa.

In general, oral mucosal lesions could be divided into:

- Oral infections
  - Fungal
  - Bacterial
  - Viral
- Vesiculobullous diseases
- Ulcerative conditions
- White lesions

To better describe the appearances of lesions and communicate these features to others, the clinician should be familiar with the following terms:

Macule: Focal area of color change which is not elevated or depressed in relation to its surroundings.

Papule: Solid, raised lesion which is less than 5 mm in diameter.

Nodule: Solid, raised lesion which is greater than 5 mm in diameter.

Sessile: Describing a tumor or growth whose base is the widest part of the lesion.

Pedunculated: Describing a tumor or growth whose base is narrower than the widest part of the lesion.

Papillary: Describing a tumor or growth exhibiting numerous surface projections.

Verrucous: Describing a tumor or growth exhibiting a rough, warty surface.

Vesicle: Superficial blister, 5 mm or less in diameter, usually filled with clear fluid.

Bulla: Large blister, greater than 5 mm in diameter.

Pustule: Blister filled with purulent exudate.

Ulcer: Lesion characterized by loss of the surface epithelium and frequently some of the underlying connective tissue. It often appears depressed or excavated.

Erosion: Superficial lesion. Often arising secondary to rupture of a vesicle or bulla, that is characterized by partial or total loss of the surface epithelium.

Fissure: Narrow, slit like ulceration or groove.

Plaque: Lesion that is slightly elevated and is flat on its surface.

Petechia: Round, pinpoint area of hemorrhage.

Ecchymosis: Nonelevated area of hemorrhage, larger than a petechia.

Telangiectasia: Vascular lesion caused by dilatation of a small, superficial blood vessel.

Cyst: Pathologic epithelium-lined cavity often filled with liquid or semi-solid contents.

Microscopical changes of oral mucosa:

- Divided into epithelial and connective tissue changes

<u>Epithelial changes:</u>

Hyperkeratosis: refers to an increase in the thickness of stratum cornium, which yields a white appearance of the oral mucosa clinically. This hyperkeratinizations can occur in keratinized area or abnormally in non-keratinized area. When the nuclei are lost from the surface the conditions is named (hyperorthokeratosis). When remnants of the nuclei persist the condition is named (hyperparakeratosis).

Hyperplasia: an increase in the thickness of the epithelium from surface to basal cell layer. An increase in the prickle cell layer is termed (acanthosis).

Epithelial dysplasia (dyskeratosis or epithelial atypia): an abnormal growth pattern of epithelial cells. Generally indicates a premalignant change.

Acantholysis: loss of adhesion between the cells of prickle cell layer (spinous cell layer) the cells appear to fall apart, which lead to vesicle formation, e.g. pemphigus vulgaris.

Connective tissue changes:

- Inflammatory infiltrate are common, as chronic inflammatory cells infiltration, e.g. gingivitis.
- Hyperplasia of connective tissue refers to an increase in the amount of collagen fibers.
- Ductal and glandular distension could be seen in many accessory mucous glands due to pressure and obstruction.

Oral infections:

Viral infections:

Herpes simplex virus (HSVs) infections occur in two forms—primary (systemic) and secondary (localized). Both forms are self-limited, but recurrences of the secondary form are common because the virus can remain within ganglionic tissue in a latent state. Physical contact with an infected individual or with body fluids is the typical route of HSV inoculation and transmission.

During the primary infection, only a small percentage of individuals show clinical signs and symptoms of infectious systemic disease, whereas a vast majority experience only subclinical disease. After resolution of primary herpetic gingivostomatitis, the virus is believed to migrate, through some unknown mechanism, to the trigeminal ganglion.

Reactivation of virus may follow exposure to sunlight (“fever blisters”), exposure to cold (“cold sores”), trauma, stress, or immunosuppression causing a secondary or recurrent infection.

Clinical Features

Primary Herpetic Gingivostomatitis. Primary disease is usually seen in children, although adults who have not been previously exposed to HSV may be affected. The vesicular eruption may appear on the skin, vermilion, and oral mucous membranes. Intraorally, lesions may appear on any mucosal surface. This is in contradistinction to the recurrent form of the disease, in which lesions are confined to the lips, hard palate, and gingiva. The primary lesions are accompanied by fever, arthralgia, malaise, anorexia, headache, and cervical lymphadenopathy.

After the systemic primary infection runs its course of about 7 to 10 days, lesions heal without scar formation. By this time, the virus may have migrated to the trigeminal ganglion to reside in a latent form.

Secondary, or Recurrent, Herpes Simplex Infection. Secondary herpes represents the reactivation of latent virus. Antibodies to HSV are present in a large majority of the population (up to 90%), and up to 40% of this group may develop secondary herpes.

Patients usually have prodromal symptoms of tingling, burning, or pain in the site at which lesions will appear. Within a matter of hours, multiple fragile and short-lived vesicles appear. These become unroofed and unite to form maplike superficial ulcers. The lesions heal without scarring in 1 to 2 weeks and rarely become secondarily infected. Regionally, most secondary lesions appear on the vermilion and surrounding skin. This type of disease is usually referred to as herpes labialis. Intraoral recurrences are almost always restricted to the hard palate or gingiva.

Herpetic Whitlow. Herpetic whitlow is a primary or a secondary HSV infection involving the finger(s). Before the universal use of examination gloves, this type of

infection typically occurred in dental practitioners who had been in physical contact with infected individuals. Contact could result in a vesiculoulcerative eruption on the digit (rather than in the oral region), along with signs and symptoms of primary systemic disease. Pain, redness, and swelling are prominent with herpetic whitlow and can be very pronounced. Vesicles or pustules eventually break and become ulcers. The duration of herpetic whitlow is protracted and may be as long as 4 to 6 weeks.

Histopathology. Microscopically, intraepithelial vesicles containing exudate, inflammatory cells, and characteristic virus-infected epithelial cells are seen. Virus-infected keratinocytes contain one or more nuclear inclusions.

Treatment: Symptomatic. In severe cases, systemic aciclovir or valaciclovir.

Varicella-zoster virus infection

Primary varicella-zoster virus (VZV) infection is known as varicella or chickenpox; secondary or reactivated disease is known as herpes zoster or shingles

Varicella is believed to be transmitted predominantly through the inhalation of contaminated droplets. The condition is very contagious and is known to spread readily from person to person.

Clinical features

Varicella

Fever, chills, malaise, and headache may accompany a rash that involves primarily the trunk and head and neck. The rash quickly develops into a vesicular eruption that becomes pustular and eventually ulcerates.

The infection is self-limiting and lasts several weeks. Oral mucous membranes may be involved in primary disease and usually demonstrate multiple shallow ulcers that are preceded by vesicles.

Herpes zoster Herpes Zoster. Zoster is essentially a condition of the older adult population and of individuals who have compromised immune responses. The sensory nerves of the trunk and head and neck are commonly affected. Involvement of various branches of the trigeminal nerve may result in unilateral oral, facial, or ocular lesions. Involvement of facial and auditory nerves produces the *Ramsay Hunt syndrome*, in which facial paralysis is accompanied by vesicles of the ipsilateral external ear, tinnitus, deafness, and vertigo.

After several days of prodromal symptoms of pain and/or paresthesia in the area of the involved dermatome, a well-delineated unilateral maculopapular rash appears. This may occasionally be accompanied by systemic symptoms. The rash quickly becomes vesicular, pustular, and then ulcerative. Remission usually occurs in several weeks.

Histopathology:

Essentially the same as those with HSV

Treatment:

For varicella in normal individuals, supportive therapy is generally indicated. However, for immunocompromised patients, more substantial measures are warranted. These include systemically administered acyclovir, vidarabine, and human leukocyte interferon. Corticosteroids generally are contraindicated

Herpangina

Herpangina is an acute viral infection caused by Coxsackie type A virus. It is transmitted by contaminated saliva and occasionally through contaminated feces.

Clinical Features. Herpangina is usually endemic, with outbreaks occurring typically in summer or early autumn. It is more common in children than in adults. Those infected generally complain of malaise, fever, dysphagia, and sore throat after a short incubation period. Intraorally, a vesicular eruption appears on the soft palate,

faucial pillars, and tonsils and persists for 4 to 6 days. A diffuse erythematous pharyngitis is also present. No associated skin lesions are typically seen.

Signs and symptoms are usually mild to moderate and generally last less than a week.

Treatment. Because herpangina is self-limiting, is mild and of short duration, and causes few complications, treatment usually is not required.

Hand-Foot-and-Mouth Disease

HFM disease is a highly contagious viral infection that usually is caused by Coxsackie type A16 or enterovirus 71. The virus is transferred from one individual to another through airborne spread or fecal-oral contamination.

Clinical Features. This viral infection typically occurs in epidemic or endemic proportions and predominantly (about 90%) affects children younger than 5 years of age. After a short incubation period, the condition resolves spontaneously in 1 to 2 weeks.

Signs and symptoms are usually mild to moderate in intensity and include low-grade fever, malaise, lymphadenopathy, and sore mouth. Pain from oral lesions is often the patient's chief complaint. Oral lesions begin as vesicles that quickly rupture to become ulcers. Lesions can occur anywhere in the mouth, although the palate, tongue, and buccal mucosa are favored sites, while the lips and gingiva are usually spared. Multiple maculopapular lesions, typically on the feet, toes, hands, and fingers, appear concomitantly with or shortly after the onset of oral lesions. These cutaneous lesions progress to a vesicular state; they eventually become ulcerated.

Histopathology. The vesicles of this condition are found within the epithelium because of obligate viral replication in keratinocytes. Eosinophilic inclusions may be seen within some of the infected epithelial cells

Treatment. Because of the relatively short duration, generally self-limiting nature, and general lack of virus-specific therapy, treatment for HFM disease is usually symptomatic

Measles (Rubeola) and German measles (Rubella)

Measles is a highly contagious viral infection caused by a member of the paramyxovirus family of viruses. Typically, oral eruptions consist of early pinpoint elevations over the soft palate that combines with ultimate involvement of the pharynx with bright erythema.

German measles, or rubella, is a contagious disease that is caused by an unrelated virus of the togavirus family. It shares some clinical features with measles, such as fever, respiratory symptoms, and rash. However, these features are very mild and short lived in German measles.

Clinical Features. After an incubation period of 7 to 10 days, prodromal symptoms of fever, malaise, coryza, conjunctivitis, photophobia, and cough develop. In 1 to 2 days, pathognomonic small erythematous macules with white necrotic centers appear in the buccal mucosa, these lesion spots, known as Koplik's spots. Koplik's spots generally precede the skin rash by 1 to 2 days. The rash initially affects the head and neck, followed by the trunk, and then the extremities.

Histopathology. Infected epithelial cells, which eventually become necrotic, overlie an inflamed connective tissue that contains dilated vascular channels and a focal inflammatory response. Lymphocytes are found in a perivascular distribution. In lymphoid tissues, large characteristic multinucleated macrophages, are seen.

Treatment. No specific treatment for measles is known. Supportive therapy of bed rest, fluids, adequate diet, and analgesics generally suffices

Bacterial infections

Necrotizing Ulcerative Gingivitis

Necrotizing ulcerative gingivitis is a relatively rare specific infectious gingival disease of young persons. Fusobacterium nucleatum, Treponema vincentii, and probably other bacteria play an important role. Predisposing factors are emotional stress, smoking, poor oral hygiene, local trauma, and HIV infection.

Clinical features. The characteristic clinical feature is painful necrosis of the interdental papillae and the gingival margins, and the formation of craters covered with a gray pseudomembrane. Spontaneous gingival bleeding, halitosis, and intense salivation are common. Fever, malaise, and lymphadenopathy are less common. Rarely, the lesions may extend beyond the gingiva (necrotizing ulcerative stomatitis).

Treatment. Systemic metronidazole and oxygen-releasing agents topically are the best therapy in the acute phase, followed by a mechanical gingival treatment.

Noma

Noma, also known as cancrum oris and gangrenous stomatitis, is a devastating disease of malnourished children that is characterized by a destructive process of the orofacial tissues. The condition is rare in developed countries. Necrosis of tissue occurs as a consequence of invasion by anaerobic bacteria in a host whose systemic health is significantly compromised.

Clinical Features. It typically affects children. The initial lesion of noma is a painful ulceration, usually of the gingiva or buccal mucosa, which spreads rapidly and eventually becomes necrotic. Denudation of involved bone may follow, eventually leading to necrosis and sequestration. Teeth in the affected area may become loose and may exfoliate. Penetration of organisms into the cheek, lip, or palate may also occur, resulting in fetid necrotic lesions.

Treatment. Therapy involves treating the underlying predisposing condition, as well as the infection itself. Therefore fluids, electrolytes, and general nutrition are restored, along with the introduction of antibiotics

Syphilis

Syphilis is a relatively common sexually transmitted disease Caused by Treponema pallidum.

Clinical features. Syphilis may be acquired (common) or congenital (rare). Acquired syphilis is classified as primary, secondary and tertiary.

The characteristic lesion in the primary stage is the chancre that appears at the site of inoculation, usually three weeks after the infection. Oral chancre appears in about 5–10% of cases, and clinically presents as a painless ulcer with a smooth surface, raised borders, and an indurated base. Regional lymphadenopathy is a constant finding.

The secondary stage begins 6–8 weeks after the appearance of the chancre, and lasts for 2–10 weeks. Oral lesions are mucous patches (common), macular syphilids, and condylomata lata (rare). Constitutional symptoms and signs (malaise, low-grade fever, headache, lacrimation, sore throat, weight loss, myalgias and multiple arthralgias, generalized lymphadenopathy) as well as cutaneous manifestations (macular syphilids, papular syphilids, condylomata lata, nail involvement, hair loss, atypical rash, etc.) are constant findings.

Tertiary syphilis begins after a period of 4–7 years. Oral lesions are gumma, atrophic glossitis, and interstitial glossitis. The most common oral lesions in congenital syphilis are a high-arched palate, short mandible, Hutchinson’s teeth, and Moon’s or mulberry molars.

Histopathology. The basic tissue response to T. pallidum infection consists of a proliferative endarteritis and infiltration of plasma cells. Spirochetes can be

demonstrated in the tissues of various lesions of syphilis using silver stains, although they may be scant in tertiary lesions. Gummas may show necrosis and greater numbers of macrophages, resulting in a granulomatous lesion that is similar to other conditions, such as tuberculosis (TB).

Treatment. Penicillin is the antibiotic of choice. Erythromycin or cephalosporins are good alternatives

Tuberculosis

Tuberculosis is a chronic, granulomatous, infectious disease that primarily affects the lungs, caused by Mycobacterium tuberculosis.

Clinical features. The oral lesions are rare, and usually secondary to pulmonary tuberculosis. The tuberculous ulcer is the most common feature. Clinically, the ulcer is painless and irregular, with a thin undermined border and a vegetating surface, usually covered by a gray-yellowish exudate. The surrounding tissues are inflamed and indurated. The dorsum of the tongue is the most commonly affected site, followed by the lip, buccal mucosa, and palate. Osteomyelitis of the jaws, periapical granuloma, regional lymphadenopathy, and scrofula are less common oral manifestations.

Histopathology. The basic microscopic lesion of TB is granulomatous inflammation, in which granulomas show central caseous necrosis. In tissues, M. tuberculosis incites a characteristic macrophage response, in which focal zones of macrophages become surrounded by lymphocytes and fibroblasts. The macrophages develop an abundant eosinophilic cytoplasm, giving them a superficial resemblance to epithelial cells; for this reason, they are frequently called epithelioid cells. Fusion of macrophages results in the appearance of Langerhans giant cells, in which nuclei are distributed around the periphery of the cytoplasm. As the granulomas age, central necrosis occurs; this is usually referred to as caseous necrosis because of the gross cheesy texture of these zones.

A Ziehl-Neelsen or Fite stain must be used to confirm the presence of the organism in the granulomas, because several infectious and noninfectious conditions may produce a similar granulomatous reaction.

Actinomycosis

Actinomycosis is a chronic bacterial disease caused by Actinomyces israelii, an anaerobic , gram-positive bacterium. Infection usually appears after trauma, surgery, or previous infection.

Clinically**,** it typically presents as swelling of the mandible that may simulate a pyogenic infection. The lesion may become indurated and eventually may form one or more draining sinuses, leading from the medullary spaces of the mandible to the skin of the neck. The clinical course ranges from acute to chronic. The skin lesions are indurated and are described as having a "woody hard" consistency. Pus draining from the chronic lesion may contain small yellow granules, known as sulfur granules, which represent aggregates of A. israelii organisms. Radiographically, this infection presents as a lucency with irregular and ill-defined margins.

Histopathology. A granulomatous inflammatory response with central abscess formation is seen in actinomycosis. At the center of the abscesses, distinctive colonies of gram-positive organisms may be seen. Radiating from the center of the colonies are numerous filaments with clubbed ends.

Treatment. Long-term, high-dose penicillin or penicillin analogs are the required antibiotic regimen for actinomycosis.

Fungal infections

Candidal infection (Candidiasis)

Candidiasis is the most common oral fungal infection. It is usually caused by Candida albicans. Predisposing factors are local (poor oral hygiene, xerostomia, mucosal damage, dentures, antibiotic mouthwashes) and systemic (broad-spectrum antibiotics, steroids, immunosuppressive drugs, radiation, HIV infection,

hematological malignancies, neutropenia, iron-deficiency anemia, cellular immunodeficiency, endocrine disorders).

Clinical features Oral candidiasis is classified as primary, consisting of

Lesions exclusively on the oral and perioral area, and secondary, consisting of oral lesions of mucocutaneous disease. Primary candidiasis includes five clinical varieties: pseudomembranous (thrush) , erythematous, papillary hyperplasia of the palate, and Candida-associated lesions (angular cheilitis, median rhomboid glossitis, denture stomatitis).

***Histopathology*:** In acute candidiasis, fungal pseudohyphae are seen penetrating the upper layers of the epithelium at acute angles. Neutrophilic infiltration of the epithelium with superficial microabscess formation is typically seen.

***Treatment*:** dealing with predisposing factors + topical and/or systemic antifungals

Deep fungal infections

Deep fungal infections are characterized by primary involvement of the lungs. Infections may disseminate from this focus to involve other organs.

Deep fungal infections having a significant incidence of oral involvement include histoplasmosis, coccidioidomycosis, blastomycosis, mucormycosis, and cryptococcosis

Clinical Features. Initial signs and symptoms of deep fungal infection are usually related to lung involvement and include cough, fever, night sweats, weight loss, chest pain, and hemoptysis. The usual oral lesion is ulcerative. Whether single or multiple, lesions are nonhealing, indurated, and frequently painful.

***Histopathology*.** The basic inflammatory response in a deep fungal infection is granulomatous. In the presence of these microorganisms, macrophages and multinucleated giant cells dominate the histologic picture

***Treatment*.** Treatment of deep mycotic infection generally consists of antimicrobials such as ketoconazole, fluconazole, and amphotericin B

Human immunodeficiency virus (HIV) infections and AIDS

The oral manifestation of HIV infection are numerous and have been divided into three groups based on the strenght of their association with HIV infection. the main lesions in each group are listed in table below

Group 1-Lesions strengthly associated with HIV infections
Candidiasis
Erythematous
Hyperplastic
Pseudomembranous
Hairy leukoplakia (EB virus)
HIV associated periodental disease
HIV gingivitis
Necrotizing ulcerative gingivitis
HIV associated periodontotis
Necrotizing stomatitis
Kaposis sarcoma
Non-Hodgkins lymphoma
Group 2-lesions less commonly associated with HIV infections
Atypical ulceration
Ideopathic thrombocytopenic purpura
Salivary gland disorders
Dry mouth, decreased salivary flow rate
Unilateral or bilateral swelling of major glands
Viral infection other than (EB virus)
Cytomegalo virus
Human papilloma virus
Varicella zoster virus
Group 3-lesions possibly associated with HIV infection

Bacterial infections other than gingivitis/periodontitis

Fungal infection other than candidiasis

Melanotic hyperpigmentation

Neurologic disturbances

Facial palsy

Trigeminal neuralgia

Oral Manifestaton of Aquired immunodyficiency system (AIDS)

Persistent generalized lymphadenopathy.

HIV lymphadenitis may be seen in the HIV scale, later in the course of the disease lymph node biopsies may be necessary to rule out lymphoma

Candidiasis.

Oral candidiasis is the most common intra oral manifestation of HIV infection and often is the presenting sign that leads to the initial diagnosis, Its presence in a patient infected with HIV is not diagnostic of AIDS but appears to be predictive for the subsequent development of full-blown AIDS in untreated patients with in 2 years

The following four clinical patterns of oral candidiasis are seen;

- Pseudomembranous
- Erythematous
- Hyperplastic
- Angular cheilitis

HIV-associated periodontal disease. Three patterns of periodontal disease are associated strongly with HIV infection:

• Linear gingival erythema
• Necrotizing ulcerative gingivitis
• Necrotizing ulcerative periodontitis

Linear gingival erythema initially was termed *HIV" Iated gingivitis* but ultimately was noted in association with other disease processes. This unusual pattern of gingivitis appears with a distinctive linear band of erythema that involves the free gingival margin and extends 2 to 3 mm apically

Necrotizing ulcerative gingivitis (NUG)

Refers to ulceration and necrosis of one or more interdental papillae with no loss of periodontal attachment. Necrotizing ulcerative periodontis (NUP) was previously termed ***HIV-associated periodontitis****;* however, it has not been seemed to be specific for HIV infection. NUP is characterized by gingival ulceration and necrosis associated with rapidly progressing loss of periodontal attachment. Although severe cases can affect all teeth,

Herpes simplex virus (HSV).

Recurrent HSV infections occur in about the same percentage of HIV-infected patients as they do in the immunocompetent population (10% to 15%); however, the lesions are more widespread, occur in an atypical pattern, and may persist for months

Varicella-zoster virus (VZV).

Recurrent VZV infection (herpes zoster) is fairly common in HIV-infected patients, oral involvement often is severe and occasionally leads to bone sequestration and loss of teeth. Associated pain typically is in tense

***Epstein-Barr virus* (EBV).**

Although EBV is thought to be associated with several forms of lymphoma in HIV infected patients, the most common EBV-related lesion in patients with AIDS is oral hairy leukoplakia (OHL). This lesion has a somewhat distinctive (but not diagnostic) pattern of hyperkeratosis and epithelial hyperplasia that is characterized by white mucosal lesions that do not rub off.

Kaposi's sarcoma (KS).

KS is a multifocal neoplasm of vascular endothelial cell origin, KS begins with single or, more frequently. Multiple lesions of the skin or oral mucosa. the trunk. arms, head, and neck are the most commonly involved anatomic sites. Oral lesions are seen in approxtmately 50% of affected patients and are the initial site of involvement in 20% to 25%. Although any mucosal site may be involved, the hard palate, gingiva, and tongue are affected most frequently the neoplasm mean invade bone and create tooth mobility

Aphthous ulcerations.

Lesions that are similar clinically to aphthous ulcerations occur with increased frequency in patients infected with HIV. All three forms (minor, major, and herpetiform) are seen

Human papillomavirus (HPV).

HPV is responsible for several facial and oral lesions in immunocompetent patients. The most frequent of which are the verruca vulgaris ***(common* wart)** and oral squamous papilloma

Histoplasmosis.

Histoplasmosis is produced by *Histoplasma capsulatum*. In healthy patients. the infection typically is subclinical and self-limiting, but clinically evident infections do

occur in immunocompromised individuals. Although a number of deep fungal infections are possible in patients with AIDS

HIV-associated salivary gland disease.

Clinically obvious salivary gland disease is noted in approximately 5% of HIV-infected patients, with a greater prevalence noted in children. The main clinical sign is salivary gland enlargement, particularly affecting the parotid. Bilateral involvement is seen in about 60% of the patients with glandular changes and often is associated with cervical lymphadenopathy

Oral squamous cell carcinoma.

Squamous cell carcinoma of the oral cavity, pharynx, and larynx has been reported in HIV-infected patients.

Oral pathology

inflammatory diseases of the bone

Inflammatory diseases of bone can be divided into three broad but overlapping categories depending largely on the extent on involvement of the bone

1-Osteitis: - this term is used to describe a localized inflammation of bone with no progression through the marrow spaces. Particularly that associated with infected sockets following removal of teeth, (dry socket).

2-Osteomyelitis: - extensive inflammation of the interior of the bone involving, and typically spreading through the marrow spaces.

3-Periostitis: - inflammation of the periosteal spaces of the bone and may not be associated with osteomyelitis.

Osteomyelitis

Osteomyelitis of the jaw was a common complication of dental sepsis before the advent of antibiotics, now it is a rare disease. Various clinical subtypes were recognized, leading to confusion in typing and classification, due to variation in the clinical and pathological features of osteomyelitis being acute, chronic, suppurative or sclerotic, this reflecting the balance between the nature and severity of the irritant, the host defense, local and systemic predisposing factors.

The vast majorities of osteomyelitis cases are caused by bacterial infections and result in an expanding lytic destruction of the involved bone, with suppuration and sequestra formation. This condition (osteomyelitis) may appropriately be termed suppurative osteomyelitis, bacterial osteomyelitis or secondary osteomyelitis. Osteomyelitis may also result from bacteremia.

Another ill defined group of an idiopathic inflammatory disorder of bone that do not responds consistently to antibacterial medications and typically demonstrate sclerosis of bone without suppuration or sequestra formation. This second pattern of inflammatory bone disease is most appropriately termed primary chronic osteomyelitis but may be included under the term of diffuse sclerosing osteomyelitis. Other pattern unique patterns of inflammatory bone diseases include focal sclerosing osteomyelitis, proliferative periostits, and alveolar osteitis.

Suppurative oseomyelitis of the jaw is uncommon in developed countries, but it is a significant difficulty in developing nations. The most common cause is odontogenic infections and jaw fractures. In Africa an important cause is the presence of acute necrotizing gingivitis or NOMA.

Predisposing factors:

1- Chronic systemic diseases, immunocompromised status, and disorders associated with decreased vascularity of bone.
2- Tobacco use, alcohol abuse and intravenous drug abuse.
3- Diabetus mellitus.
4- exanthematous fever and malaria
5- sickle cell anemia
6- malnutrition
7- malignancy
8- collagen vascular disease
9- AIDS
10- Radiation.
11- osteopetrosis, dysosteosclerosis, pagets disease, end-stage cemento-osseous dysplasia, may result in hypovascularized bone that is predisposed to necrosis and inflammation.

Acute suppurative osteomyelitis the condition results when an acute inflammatory process spreads through the medullary spaces of the bone and insufficient time has passed for the body to react to the presence of the inflammatory infiltrate.

Chronic suppurative osteomyelitis: the condition result when the defensive response leads to the production of granulation tissue, which subsequently forms dense scar tissue in an attempt to wall of the infected area. The encircled dead space acts as a reservoir for bacteria, and antibiotics are difficult to reach the site. This pattern begins to evolve about one month after the spread of the initial acute infection and results in a smoldering process that is difficult to manage unless the problem is treated aggressively.

Acute osteomyelitis.

Patients with acute osteomyelitis have signs and symptoms of an acute inflammatory process that has typically been less than 1 month in duration, Fever, leukocytosis, lymphadenopathy, significant sensitivity and soft tissue swelling of the affected area may be present. The radiographs may be unremarkable or may demonstrate an ill-defined radiolucency. On occasion; Paresthesia of the lower lip occur, drainage or exfoliation of fragments of necrotic bone may be discovered. ***A fragment of necrotic bone that has separated from the adjacent vital bone is termed a sequestrum.***

Sequestra often exhibit spontaneous exfoliation, On occasion; ***Fragments of necrotic bone may become surrounded by vital bone and the mass of encased nonvital bone is called an involucrum.***

Chronic osteomyelitis.

If acute osteomyelitis is not resolved expeditiously, the enhancement of chronic osteomyelitis occurs, or the process may arise primarily without a previous acute episode. There may be swelling, pain, sinus formation, purulent discharge, sequestrum formation, tooth loss, or pathologic fracture, Patients may experience acute exacerbation or periods of decreased pain associated with chronic smoldering progression. Radiographs reveal a patchy, ragged and ill-defined radiolucency that often contains

central radiopaque sequestra, occasionally; the surrounding bone may exhibit an increased radiodensity, and the cortical surface can demonstrate significant osteogenic periosteal hyperplasia. Because of an anatomic peculiarity, large portions of each jawbone receive their blood supply through multiple arterial loops originating from a single vessel. Involvement of this single feeder vessel can lead to necrosis of a large portion of the affected bone. Sequestration that has involved an entire quadrant of the jaw has been reported in long-standing cases of chronic osteomyelitis.

Histopathologic Features

Acute osteomyelitis.

Generation of biopsy material from patients with acute osteomyelitis is not common because of the predominantly liquid content and lack of a soft-tissue component. When submitted, the material consists predominantly of necrotic bone. The bone shows a loss of the osteocytes from their lacunae. Peripheral resorption and bacterial colonization. The periphery of the bone and the haversian canals contain necrotic debris and an acute inflammatory infiltrate consisting of polymorphonuclear leukocytes. The submitted material will be diagnosed as a sequestrum unless a good clinicopathologic correlation points to the appropriate diagnosis of acute osteomyelitis.

Chronic osteomyelitis.

Biopsy material from patients with chronic osteomyelitis demonstrates a significant soft issue component that consists of chronically or sub acutely in flamed fibrous connective tissue filling the lntertrabecular areas of the bone. Scattered sequestra and pockets of abscess formation are common.

Treatment and Prognosis

Acute osteomyelitis.

If obvious abscess formation is note, the treatment of acute osteomyelitis consists of antibiotics and drainage. Microbiologic study of the infectious material typically reveals

a polymicrobial infection of organisms normally present in the oral cavity. The antibiotics most frequently selected include penicillin, clindamycin,cephalexin,cefotaxime, tobramycin, and gentamicin. In most patients, a sufficient and appropriate antibiotic regimen aborts the infection and averts the need for surgical intervention. Several investigators have suggested that antibiotic therapy can bring about sterilization of the sequestra; therefore, these non vital bone fragments should be allowed to remain in place as scaffolding for the future development of new bone.

Chronic osteomyelitis

Chronic osteomyelitis is difficult to manage medically, presumably because pockets of dead bone and organisms are protected from antibiotics by the surrounding wall of fibrous connective tissue. Surgical intervention is mandatory. The antibiotics are similar to those used in the acute form but must be given intravenously in high doses. The extent of the surgical intervention depends on the spread of the process; removal of all infected material down to good bleeding bone is mandatory in all cases. For small lesions, curettage, removal of necrotic bone, and saucerization are sufficient.

In patients with more extensive osteomyelitis decortications or saucerization often is combined with transplantation of cancellous bone chips. In cases of persisting osteomyelitis, resection of the diseased bone followed by immediate reconstruction with an autologous graft is required. Weakened jawbones must be immobilized. The goal of surgery is removal of all infected tissue. Persistence of chronic osteomyelitis is typically due to incomplete removal of diseased tissue. Upon successful elimination of all infected material, resolution is expected. Adjunctive procedures (e.g. hyperbaric oxygen) are rarely necessary if thorough surgical curettage and sequestrectomy have been accomplished. Hyperbaric oxygen is primarily recommended for the rare patient who does not respond to standard therapy or for disease arising in hypovascularized bone (e.g., osteoradionecrosis, osteopetrosis, Paget's disease. cemento-osseous dysplasia).

Focal Sclerosing Osteitis

Etiology

Focal sclerosing osteitis is a relatively common phenomenon that is believed to represent a focal bony reaction to a low-grade inflammatory stimulus. It is usually seen at the apex of a tooth with long-standing pulpitis. This lesion may occasionally be adjacent to a sound, unrestored tooth, suggesting that other etiologic factors such as malocclusion may be operative. Synonyms for focal sclerosing osteitis include focal sclerosing osteomyelitis, bony scar, condensing osteitis, and sclerotic bone. The term focal periapical osteopetrosis has also been used to describe idiopathic lesions associated with normal, caries-free teeth.

Clinical Features

Focal sclerosing osteitis may be found at any age but is typically discovered in young adults. Patients are usually asymptomatic, and most lesions are discovered on routine radiographic examination. A majority are found at the apices of mandibular first molars, with a minority associated with mandibular second molars and premolars. When teeth are extracted, these lesions remain behind indefinitely.

Radiographically, one of several patterns may be seen. The lesion may be uniformly opaque, it may have a peripheral lucency with an opaque center, it may have an opaque periphery with a lucent center, or it may be composed of confluent or lobulated opaque masses.

Histopathology

Microscopically, these lesions are masses of dense sclerotic bone; Connective tissue is scant, as are inflammatory cells.

Differential Diagnosis

Differential diagnosis should include periapical cemental dysplasia, osteoma, complex odontoma, cementoblastoma, osteoblastoma, and hypercementosis. In most cases,

however, diagnosis can be made with confidence on the basis of historical and radiographic features.

Treatment

Because it is believed to represent a physiologic bone reaction to a known stimulus, the lesion itself need not be removed. A biopsy might be contemplated to rule out more significant lesions that received serious consideration in the differential diagnosis. The inflamed pulp that stimulated the focal sclerosing osteomyelitis should be treated. The decision about whether the tooth should be restored, treated endodontically, or extracted should be made on a case-by-case basis according to findings.

DIFFUSE SCIEROSING OSTEOMYELITIS

Diffuse sclerosing osteomyelitis is an ill-defined, highly controversial, evolving area of dental medicine. This diagnosis encompasses a group of presentations that are characterized by pain, inflammation, and varying degrees of gnathic periosteal hyperplasia, sclerosis, and lucency. On occasion, diffuse sclerosing osteomyelitis can be confused with secondarily inflamed intraosseous pathoses (florid cementosseous dysplasia) or Paget's disease of bone. In spite of the clinical and radiographic similarities, these processes can be separated from diffuse sclerosing osteomyelitis because of various clinical, radiographic and histopatholog differences the remaining pathoses can be grouped under three major categories:

1-Diffuse sclerosing oseomyelitis

2-Primary chronic osteomylitis

3-Chronic tendoperiostitis

Etiology

Diffuse sclerosing osteomyelitis represents an inflammatory reaction in the mandible or maxilla, believed to be in response to a microorganism of low virulence. Bacteria are generally suspected as causative agents, although they are seldom specifically identified.

Chronic periodontal disease, which appears to provide a portal of entry for bacteria, is important in the etiology and progression of diffuse sclerosing osteomyelitis. Carious non vital teeth are less often implicated.

Clinical Features

This condition may be seen in any age, in either sex, and in any race, but it tends to occur most often in middle-aged black women. The disease is typified by a protracted chronic course with acute exacerbations of pain, swelling, and occasionally drainage.

Radiographically:

This process is diffuse, typically affecting a large part of the jaw. The lesion is ill defined. Early lucent zones may appear in association with sclerotic masses. In advanced stages, sclerosis dominates the radiographic picture. Periosteal thickening may also be seen. Scintigraphy may be particularly useful in evaluating the extent of this condition.

Histopathology

The microscopic changes of this condition are inflammatory, Fibrous replacement of marrow is noted; a chronic inflammatory cell infiltrate and occasionally a neutrophilic infiltrate are also seen. Bony trabeculae exhibit irregular size and shape and may be lined by numerous osteoblasts, Focal osteoclastic activity is also present. The characteristic sclerotic masses are composed of dense bone, often exhibiting numerous reversal lines.

Differential Diagnosis Chronic sclerosing osteomyelitis shares many clinical, radiographic, and histological features with florid osseous dysplasia. The two should be separated, because the former is an inflammatory/infectious process and the latter a bony dysplastic process. Treatment and prognosis are therefore dissimilar. Florid osseous dysplasia appears to be an extensive form of periapical cemental dysplasia and, unlike

diffuse sclerosing osteomyelitis, may exhibit anterior periapical lesions and traumatic or simple bone cysts. Furthermore, florid osseous dysplasia is usually asymptomatic and appears as a fibroosseous lesion lacking an inflammatory cell infiltrate.

Treatment

The management of diffuse sclerosing osteomyelitis is problematic because of the relative avascular nature of the affected tissue and because of the large size of the lesion. Even with aggressive treatment, the course is protracted. If an etiologic factor such as periodontal disease or a carious tooth can be identified, it should be eliminated. Antibiotics are the mainstay of treatment and are especially helpful during painful exacerbations. Surgical removal of the diseased area is usually an inappropriate procedure because of the extent of the disease. However, decortication of the affected site has resulted in improvement in some cases. Low-dose corticosteroids have also been used with some success. Hyperbaric oxygen therapy may prove to be a valuable adjunct. Recently, treatment with pamidronate has shown promising results.

Chronic Osteomyelitis with Proliferative Periostitis: (Garré's Osteomyelitis)

Etiology

Chronic osteomyelitis with proliferative periostitis, commonly known as Garré's osteomyelitis, is essentially a subtype of osteomyelitis that has a prominent periosteal inflammatory reaction as an additional component. It most often results from a periapical abscess of a mandibular molar tooth or an infection associated with tooth extraction or partially erupted molars, It is most common in children.

- The eponym Garré's osteomyelitis has been applied to this condition after the author, Dr. K. Garrés, who in1893 described the clinical features of 72 patients with osteomyelitis. The disease he described was most common in the femur, with

only three cases occurring in the jaws. In the absence of histological and radiographic findings, which were unavailable at the time of the report, it is likely that Garrés was describing a form of recalcitrant, acute osteomyelitis that occurred in both adults and children. It was not chronic osteomyelitis with proliferative periostitis. Therefore, the term Garré's osteomyelitis, although widely used in reference to this condition, is inaccurate.

Clinical Features

This variety of osteomyelitis is uncommonly encountered. It has been described in the tibia, and in the head and neck area, it is seen in the mandible. It typically involves the posterior mandible and is usually unilateral. Patients characteristically present with an asymptomatic bony, hard swelling with normal appearing overlying skin and mucosa. On occasion, slight tenderness may be noted.

This presentation necessitates the differentiation of this process from benign mandibular neoplasms. Radiographs and a biopsy provide a definitive diagnosis.

Radiographically, the lesion appears centrally as a mottled, predominantly lucent lesion in a pattern consistent with that of chronic osteomyelitis. The feature that provides the distinctive difference is the periosteal reaction. This, best viewed on an occlusal radiograph, appears as an expanded cortex, often with concentric or parallel opaque layers. Trabeculae perpendicular to the onion skin layers may also be apparent.

Histopathology

Reactive new bone typifies the subperiosteal cortical response. Perpendicular orientation of new trabeculae to redundant cortical bone is best seen under low magnification. Osteoblasts dominate in this area, and both osteoblasts and osteoclasts are seen centrally. Marrow spaces contain fibrous tissue with scattered lymphocytes and plasma cells.

Inflammatory cells are often surprisingly scant, making microscopic differentiation from fibroosseous lesions a diagnostic challenge.

Treatment : Identification and removal of the offending agent are of primary importance in chronic osteomyelitis with proliferative periostitis. Removal of the involved tooth is usually required. Antibiotics are generally included early in this treatment. The mandible then undergoes gradual remodeling without additional surgical intervention.

Osteoradionecrosis

Osteoradionecrosis is one of the most serious complications of radiation to the head and neck but is seen less frequently today because of better treatment modalities and prevention. The current prevalence rate is less than 4%, whereas the frequency approached 15% less than 20 years ago. Although the risk is low, it increases dramatically if a local surgical procedure is performed within 21 days of therapy initiation or between 4 and 12 months after therapy. Radiation of bone results in permanent damage:' to the osteocytes and microvasculature system. The altered bone becomes hypoxic, hypovascular, and hypocellular. Osteoradionecrosis is the result of nonhealing, dead bone; infection is not necessarily present.

Bisphosphonate-Associated Osteonecrosis

A similar type of jaw necrosis may be seen as a complication of bisphosphonate therapy (e.g., pamidronate, zoledronic acid). Bisphosphonates are currently used as part of the treatment regimen for patients with multiple myeloma, metastatic cancers to bone (e.g., breast or prostate cancer), Paget's disease, and osteoporosis because of their inhibitory effect on osteoclastic bone resorption.

Bisphosphonates, taken for an extended period (greater than 1 year), but the patient at risk for non infectious jaw necrosis.

The typical presenting clinical symptom of bisphosphonate-associated osteonecrosis is pain, and the characteristic sign is bone exposure. The lesion usually follows tooth extraction or other form of jaw surgery, although many cases seem to be spontaneous. As with osteoradionecrosis, the mandible is more commonly affected than the maxilla.

Alveolar osteitis
(drysocket; fibrinolytic alveolitis)

After extraction of a tooth, a blood clot is formed at the site, with eventual organization of the clot by granulation tissue, gradual replacement by coarse fibrillar bone, and, finally, replacement by mature bone. Destruction of the initial clot prevents appropriate healing and causes clinical syndrome known as alveolar osteitis . Extensive investigations have shown that the clot is lost secondary to transformation of plasminogen to plasmin, with subsequent lysis of fibrin and formation of kinins (fibrinolytic alveolitis): these are potent pain mediators. Local trauma, estrogens, and bacterial pyrogens are known to stimulate fibrinolysins. This knowledge correlates well with the increased frequency of alveolar osteitis in association with inexperienced surgeons, traumatic extractions, oral contraceptive use and presurgical infections. In addition, inadequate irrigation at surgery and the use of tobacco products have been related to the development of the problem.

Clinical Features

The frequency of alveolar osteitis is higher in the mandible and the posterior areas. After oral contraceptive use is taken into account. They do not appear to be a significant sex predilection. The prevalence is between 1% and 3% of all extractions, but it increases to 25% to *30%* for impacted mandibular third molars. The frequency appears to be

decreased when impacted teeth are prophylactically removed rather than for therapeutic reasons after development of chronic inflammation of pericoronal tissues.

The overall prevalence is highest between 20 and 40 years of age (when the majority of teeth are extracted. although the likelihood of developing alveolar osteitis appears greatest for extractions in the *40*- to 45-year-old age group The affected extraction site is filled initially with a dirty gray clot that is lost and leaves a bare bony socket (dry socket). The detection of the bare socket may be hindered by partial retention of the clot or by overlying inflamed tissue that covers the site. The diagnosis is confirmed by probing of the socket, which reveals exposed and extremely sensitive bone. Typically, severe pain, foul odor, and (less frequently) swelling and lymphadenopathy develop 3 to 4 days after ext reaction of the tooth. The signs and symptoms may last from 10 to 40 days.

Treatment and Prognosis

On evaluation of the patient complaining of postextraction pain, a radiograph should be taken of the affected area to rule out the possibility of a retained root tip or a foreign body. All sutures should be removed. The socket is irrigated with warm saline, followed by thorough clinical inspection of the socket for any unexpected pathosis. Curettage of the socket is not recommended, because this typically increases the associated pain. Potent oral analgesics should be prescribed, and the patient should be given a plastic syringe with instructions to keep the socket clean via home irrigation with a chlorhexidine or saline solution. This irrigation should continue until debris no longer collects within the healing socket (usually 3 to 4 weeks).

Oral pathology

Oral mucosal lesions

The oral cavity is lined by a membrane composed of stratified squamous epithelium. This epithelium serves as a cover for the oral soft tissues as a barrier to the entry of external pathogenic factors. Depending on the intraoral site, the stratified squamous epithelium may be non-keratinized, orthokeratinized or parakeratinized.

Knowledge of clinical aspects of oral mucosal diseases must be correlated with oral anatomy. E.g. recurrent aphthous stomatitis occurs primarily on the nonkeratinized mucosa, whereas recurrent herpes simplex infections occur almost exclusively on the keratinized mucosa.

In general, oral mucosal lesions could be divided into:

- Oral infections
  - Fungal
  - Bacterial
  - Viral
- Vesiculobullous diseases
- Ulcerative conditions
- White lesions

To better describe the appearances of lesions and communicate these features to others, the clinician should be familiar with the following terms:

Macule: Focal area of color change which is not elevated or depressed in relation to its surroundings.

Papule: Solid, raised lesion which is less than 5 mm in diameter.

Nodule: Solid, raised lesion which is greater than 5 mm in diameter.

Sessile: Describing a tumor or growth whose base is the widest part of the lesion.

Pedunculated: Describing a tumor or growth whose base is narrower than the widest part of the lesion.

Papillary: Describing a tumor or growth exhibiting numerous surface projections.

Verrucous: Describing a tumor or growth exhibiting a rough, warty surface.

Vesicle: Superficial blister, 5 mm or less in diameter, usually filled with clear fluid.

Bulla: Large blister, greater than 5 mm in diameter.

Pustule: Blister filled with purulent exudate.

Ulcer: Lesion characterized by loss of the surface epithelium and frequently some of the underlying connective tissue. It often appears depressed or excavated.

Erosion: Superficial lesion. Often arising secondary to rupture of a vesicle or bulla, that is characterized by partial or total loss of the surface epithelium.

Fissure: Narrow, slit like ulceration or groove.

Plaque: Lesion that is slightly elevated and is flat on its surface.

Petechia: Round, pinpoint area of hemorrhage.

Ecchymosis: Nonelevated area of hemorrhage, larger than a petechia.

Telangiectasia: Vascular lesion caused by dilatation of a small, superficial blood vessel.

Cyst: Pathologic epithelium-lined cavity often filled with liquid or semi-solid contents.

Microscopical changes of oral mucosa:

- Divided into epithelial and connective tissue changes

<u>Epithelial changes:</u>

Hyperkeratosis: refers to an increase in the thickness of stratum cornium, which yields a white appearance of the oral mucosa clinically. This hyperkeratinizations can occur in keratinized area or abnormally in non-keratinized area. When the nuclei are lost from the surface the conditions is named (hyperorthokeratosis). When remnants of the nuclei persist the condition is named (hyperparakeratosis).

Hyperplasia: an increase in the thickness of the epithelium from surface to basal cell layer. An increase in the prickle cell layer is termed (acanthosis).

Epithelial dysplasia (dyskeratosis or epithelial atypia): an abnormal growth pattern of epithelial cells. Generally indicates a premalignant change.

Acantholysis: loss of adhesion between the cells of prickle cell layer (spinous cell layer) the cells appear to fall apart, which lead to vesicle formation, e.g. pemphigus vulgaris.

Connective tissue changes:

- Inflammatory infiltrate are common, as chronic inflammatory cells infiltration, e.g. gingivitis.
- Hyperplasia of connective tissue refers to an increase in the amount of collagen fibers.
- Ductal and glandular distension could be seen in many accessory mucous glands due to pressure and obstruction.

Oral infections:

Viral infections:

Herpes simplex virus (HSVs) infections occur in two forms—primary (systemic) and secondary (localized). Both forms are self-limited, but recurrences of the secondary form are common because the virus can remain within ganglionic tissue in a latent state. Physical contact with an infected individual or with body fluids is the typical route of HSV inoculation and transmission.

During the primary infection, only a small percentage of individuals show clinical signs and symptoms of infectious systemic disease, whereas a vast majority experience only subclinical disease. After resolution of primary herpetic gingivostomatitis, the virus is believed to migrate, through some unknown mechanism, to the trigeminal ganglion.

Reactivation of virus may follow exposure to sunlight (“fever blisters”), exposure to cold (“cold sores”), trauma, stress, or immunosuppression causing a secondary or recurrent infection.

Clinical Features

Primary Herpetic Gingivostomatitis. Primary disease is usually seen in children, although adults who have not been previously exposed to HSV may be affected. The vesicular eruption may appear on the skin, vermilion, and oral mucous membranes. Intraorally, lesions may appear on any mucosal surface. This is in contradistinction to the recurrent form of the disease, in which lesions are confined to the lips, hard palate, and gingiva. The primary lesions are accompanied by fever, arthralgia, malaise, anorexia, headache, and cervical lymphadenopathy.

After the systemic primary infection runs its course of about 7 to 10 days, lesions heal without scar formation. By this time, the virus may have migrated to the trigeminal ganglion to reside in a latent form.

Secondary, or Recurrent, Herpes Simplex Infection. Secondary herpes represents the reactivation of latent virus. Antibodies to HSV are present in a large majority of the population (up to 90%), and up to 40% of this group may develop secondary herpes.

Patients usually have prodromal symptoms of tingling, burning, or pain in the site at which lesions will appear. Within a matter of hours, multiple fragile and short-lived vesicles appear. These become unroofed and unite to form maplike superficial ulcers. The lesions heal without scarring in 1 to 2 weeks and rarely become secondarily infected. Regionally, most secondary lesions appear on the vermilion and surrounding skin. This type of disease is usually referred to as herpes labialis. Intraoral recurrences are almost always restricted to the hard palate or gingiva.

Herpetic Whitlow. Herpetic whitlow is a primary or a secondary HSV infection involving the finger(s). Before the universal use of examination gloves, this type of

infection typically occurred in dental practitioners who had been in physical contact with infected individuals. Contact could result in a vesiculoulcerative eruption on the digit (rather than in the oral region), along with signs and symptoms of primary systemic disease. Pain, redness, and swelling are prominent with herpetic whitlow and can be very pronounced. Vesicles or pustules eventually break and become ulcers. The duration of herpetic whitlow is protracted and may be as long as 4 to 6 weeks.

Histopathology. Microscopically, intraepithelial vesicles containing exudate, inflammatory cells, and characteristic virus-infected epithelial cells are seen. Virus-infected keratinocytes contain one or more nuclear inclusions.

Treatment: Symptomatic. In severe cases, systemic aciclovir or valaciclovir.

Varicella-zoster virus infection

Primary varicella-zoster virus (VZV) infection is known as varicella or chickenpox; secondary or reactivated disease is known as herpes zoster or shingles

Varicella is believed to be transmitted predominantly through the inhalation of contaminated droplets. The condition is very contagious and is known to spread readily from person to person.

Clinical features

Varicella

Fever, chills, malaise, and headache may accompany a rash that involves primarily the trunk and head and neck. The rash quickly develops into a vesicular eruption that becomes pustular and eventually ulcerates.

The infection is self-limiting and lasts several weeks. Oral mucous membranes may be involved in primary disease and usually demonstrate multiple shallow ulcers that are preceded by vesicles.

Herpes zoster Herpes Zoster. Zoster is essentially a condition of the older adult population and of individuals who have compromised immune responses. The sensory nerves of the trunk and head and neck are commonly affected. Involvement of various branches of the trigeminal nerve may result in unilateral oral, facial, or ocular lesions. Involvement of facial and auditory nerves produces the *Ramsay Hunt syndrome*, in which facial paralysis is accompanied by vesicles of the ipsilateral external ear, tinnitus, deafness, and vertigo.

After several days of prodromal symptoms of pain and/or paresthesia in the area of the involved dermatome, a well-delineated unilateral maculopapular rash appears. This may occasionally be accompanied by systemic symptoms. The rash quickly becomes vesicular, pustular, and then ulcerative. Remission usually occurs in several weeks.

Histopathology:

Essentially the same as those with HSV

Treatment:

For varicella in normal individuals, supportive therapy is generally indicated. However, for immunocompromised patients, more substantial measures are warranted. These include systemically administered acyclovir, vidarabine, and human leukocyte interferon. Corticosteroids generally are contraindicated

Herpangina

Herpangina is an acute viral infection caused by Coxsackie type A virus. It is transmitted by contaminated saliva and occasionally through contaminated feces.

Clinical Features. Herpangina is usually endemic, with outbreaks occurring typically in summer or early autumn. It is more common in children than in adults. Those infected generally complain of malaise, fever, dysphagia, and sore throat after a short incubation period. Intraorally, a vesicular eruption appears on the soft palate,

faucial pillars, and tonsils and persists for 4 to 6 days. A diffuse erythematous pharyngitis is also present. No associated skin lesions are typically seen.

Signs and symptoms are usually mild to moderate and generally last less than a week.

Treatment. Because herpangina is self-limiting, is mild and of short duration, and causes few complications, treatment usually is not required.

Hand-Foot-and-Mouth Disease

HFM disease is a highly contagious viral infection that usually is caused by Coxsackie type A16 or enterovirus 71. The virus is transferred from one individual to another through airborne spread or fecal-oral contamination.

Clinical Features. This viral infection typically occurs in epidemic or endemic proportions and predominantly (about 90%) affects children younger than 5 years of age. After a short incubation period, the condition resolves spontaneously in 1 to 2 weeks.

Signs and symptoms are usually mild to moderate in intensity and include low-grade fever, malaise, lymphadenopathy, and sore mouth. Pain from oral lesions is often the patient's chief complaint. Oral lesions begin as vesicles that quickly rupture to become ulcers. Lesions can occur anywhere in the mouth, although the palate, tongue, and buccal mucosa are favored sites, while the lips and gingiva are usually spared. Multiple maculopapular lesions, typically on the feet, toes, hands, and fingers, appear concomitantly with or shortly after the onset of oral lesions. These cutaneous lesions progress to a vesicular state; they eventually become ulcerated.

Histopathology. The vesicles of this condition are found within the epithelium because of obligate viral replication in keratinocytes. Eosinophilic inclusions may be seen within some of the infected epithelial cells

Treatment. Because of the relatively short duration, generally self-limiting nature, and general lack of virus-specific therapy, treatment for HFM disease is usually symptomatic

Measles (Rubeola) and German measles (Rubella)

Measles is a highly contagious viral infection caused by a member of the paramyxovirus family of viruses. Typically, oral eruptions consist of early pinpoint elevations over the soft palate that combines with ultimate involvement of the pharynx with bright erythema.

German measles, or rubella, is a contagious disease that is caused by an unrelated virus of the togavirus family. It shares some clinical features with measles, such as fever, respiratory symptoms, and rash. However, these features are very mild and short lived in German measles.

Clinical Features. After an incubation period of 7 to 10 days, prodromal symptoms of fever, malaise, coryza, conjunctivitis, photophobia, and cough develop. In 1 to 2 days, pathognomonic small erythematous macules with white necrotic centers appear in the buccal mucosa, these lesion spots, known as Koplik's spots. Koplik's spots generally precede the skin rash by 1 to 2 days. The rash initially affects the head and neck, followed by the trunk, and then the extremities.

Histopathology. Infected epithelial cells, which eventually become necrotic, overlie an inflamed connective tissue that contains dilated vascular channels and a focal inflammatory response. Lymphocytes are found in a perivascular distribution. In lymphoid tissues, large characteristic multinucleated macrophages, are seen.

Treatment. No specific treatment for measles is known. Supportive therapy of bed rest, fluids, adequate diet, and analgesics generally suffices

Bacterial infections

Necrotizing Ulcerative Gingivitis

Necrotizing ulcerative gingivitis is a relatively rare specific infectious gingival disease of young persons. Fusobacterium nucleatum, Treponema vincentii, and probably other bacteria play an important role. Predisposing factors are emotional stress, smoking, poor oral hygiene, local trauma, and HIV infection.

Clinical features. The characteristic clinical feature is painful necrosis of the interdental papillae and the gingival margins, and the formation of craters covered with a gray pseudomembrane. Spontaneous gingival bleeding, halitosis, and intense salivation are common. Fever, malaise, and lymphadenopathy are less common. Rarely, the lesions may extend beyond the gingiva (necrotizing ulcerative stomatitis).

Treatment. Systemic metronidazole and oxygen-releasing agents topically are the best therapy in the acute phase, followed by a mechanical gingival treatment.

Noma

Noma, also known as cancrum oris and gangrenous stomatitis, is a devastating disease of malnourished children that is characterized by a destructive process of the orofacial tissues. The condition is rare in developed countries. Necrosis of tissue occurs as a consequence of invasion by anaerobic bacteria in a host whose systemic health is significantly compromised.

Clinical Features. It typically affects children. The initial lesion of noma is a painful ulceration, usually of the gingiva or buccal mucosa, which spreads rapidly and eventually becomes necrotic. Denudation of involved bone may follow, eventually leading to necrosis and sequestration. Teeth in the affected area may become loose and may exfoliate. Penetration of organisms into the cheek, lip, or palate may also occur, resulting in fetid necrotic lesions.

Treatment. Therapy involves treating the underlying predisposing condition, as well as the infection itself. Therefore fluids, electrolytes, and general nutrition are restored, along with the introduction of antibiotics

Syphilis

Syphilis is a relatively common sexually transmitted disease Caused by Treponema pallidum.

Clinical features. Syphilis may be acquired (common) or congenital (rare). Acquired syphilis is classified as primary, secondary and tertiary.

The characteristic lesion in the primary stage is the chancre that appears at the site of inoculation, usually three weeks after the infection. Oral chancre appears in about 5–10% of cases, and clinically presents as a painless ulcer with a smooth surface, raised borders, and an indurated base. Regional lymphadenopathy is a constant finding.

The secondary stage begins 6–8 weeks after the appearance of the chancre, and lasts for 2–10 weeks. Oral lesions are mucous patches (common), macular syphilids, and condylomata lata (rare). Constitutional symptoms and signs (malaise, low-grade fever, headache, lacrimation, sore throat, weight loss, myalgias and multiple arthralgias, generalized lymphadenopathy) as well as cutaneous manifestations (macular syphilids, papular syphilids, condylomata lata, nail involvement, hair loss, atypical rash, etc.) are constant findings.

Tertiary syphilis begins after a period of 4–7 years. Oral lesions are gumma, atrophic glossitis, and interstitial glossitis. The most common oral lesions in congenital syphilis are a high-arched palate, short mandible, Hutchinson’s teeth, and Moon’s or mulberry molars.

Histopathology. The basic tissue response to T. pallidum infection consists of a proliferative endarteritis and infiltration of plasma cells. Spirochetes can be

demonstrated in the tissues of various lesions of syphilis using silver stains, although they may be scant in tertiary lesions. Gummas may show necrosis and greater numbers of macrophages, resulting in a granulomatous lesion that is similar to other conditions, such as tuberculosis (TB).

Treatment. Penicillin is the antibiotic of choice. Erythromycin or cephalosporins are good alternatives

Tuberculosis

Tuberculosis is a chronic, granulomatous, infectious disease that primarily affects the lungs, caused by Mycobacterium tuberculosis.

Clinical features. The oral lesions are rare, and usually secondary to pulmonary tuberculosis. The tuberculous ulcer is the most common feature. Clinically, the ulcer is painless and irregular, with a thin undermined border and a vegetating surface, usually covered by a gray-yellowish exudate. The surrounding tissues are inflamed and indurated. The dorsum of the tongue is the most commonly affected site, followed by the lip, buccal mucosa, and palate. Osteomyelitis of the jaws, periapical granuloma, regional lymphadenopathy, and scrofula are less common oral manifestations.

Histopathology. The basic microscopic lesion of TB is granulomatous inflammation, in which granulomas show central caseous necrosis. In tissues, M. tuberculosis incites a characteristic macrophage response, in which focal zones of macrophages become surrounded by lymphocytes and fibroblasts. The macrophages develop an abundant eosinophilic cytoplasm, giving them a superficial resemblance to epithelial cells; for this reason, they are frequently called epithelioid cells. Fusion of macrophages results in the appearance of Langerhans giant cells, in which nuclei are distributed around the periphery of the cytoplasm. As the granulomas age, central necrosis occurs; this is usually referred to as caseous necrosis because of the gross cheesy texture of these zones.

A Ziehl-Neelsen or Fite stain must be used to confirm the presence of the organism in the granulomas, because several infectious and noninfectious conditions may produce a similar granulomatous reaction.

Actinomycosis

Actinomycosis is a chronic bacterial disease caused by Actinomyces israelii, an anaerobic , gram-positive bacterium. Infection usually appears after trauma, surgery, or previous infection.

Clinically**,** it typically presents as swelling of the mandible that may simulate a pyogenic infection. The lesion may become indurated and eventually may form one or more draining sinuses, leading from the medullary spaces of the mandible to the skin of the neck. The clinical course ranges from acute to chronic. The skin lesions are indurated and are described as having a "woody hard" consistency. Pus draining from the chronic lesion may contain small yellow granules, known as sulfur granules, which represent aggregates of A. israelii organisms. Radiographically, this infection presents as a lucency with irregular and ill-defined margins.

Histopathology. A granulomatous inflammatory response with central abscess formation is seen in actinomycosis. At the center of the abscesses, distinctive colonies of gram-positive organisms may be seen. Radiating from the center of the colonies are numerous filaments with clubbed ends.

Treatment. Long-term, high-dose penicillin or penicillin analogs are the required antibiotic regimen for actinomycosis.

Fungal infections

Candidal infection (Candidiasis)

Candidiasis is the most common oral fungal infection. It is usually caused by Candida albicans. Predisposing factors are local (poor oral hygiene, xerostomia, mucosal damage, dentures, antibiotic mouthwashes) and systemic (broad-spectrum antibiotics, steroids, immunosuppressive drugs, radiation, HIV infection,

hematological malignancies, neutropenia, iron-deficiency anemia, cellular immunodeficiency, endocrine disorders).

Clinical features Oral candidiasis is classified as primary, consisting of

Lesions exclusively on the oral and perioral area, and secondary, consisting of oral lesions of mucocutaneous disease. Primary candidiasis includes five clinical varieties: pseudomembranous (thrush) , erythematous, papillary hyperplasia of the palate, and Candida-associated lesions (angular cheilitis, median rhomboid glossitis, denture stomatitis).

***Histopathology*:** In acute candidiasis, fungal pseudohyphae are seen penetrating the upper layers of the epithelium at acute angles. Neutrophilic infiltration of the epithelium with superficial microabscess formation is typically seen.

***Treatment*:** dealing with predisposing factors + topical and/or systemic antifungals

Deep fungal infections

Deep fungal infections are characterized by primary involvement of the lungs. Infections may disseminate from this focus to involve other organs.

Deep fungal infections having a significant incidence of oral involvement include histoplasmosis, coccidioidomycosis, blastomycosis, mucormycosis, and cryptococcosis

Clinical Features. Initial signs and symptoms of deep fungal infection are usually related to lung involvement and include cough, fever, night sweats, weight loss, chest pain, and hemoptysis. The usual oral lesion is ulcerative. Whether single or multiple, lesions are nonhealing, indurated, and frequently painful.

***Histopathology*.** The basic inflammatory response in a deep fungal infection is granulomatous. In the presence of these microorganisms, macrophages and multinucleated giant cells dominate the histologic picture

***Treatment*.** Treatment of deep mycotic infection generally consists of antimicrobials such as ketoconazole, fluconazole, and amphotericin B

Human immunodeficiency virus (HIV) infections and AIDS

The oral manifestation of HIV infection are numerous and have been divided into three groups based on the strenght of their association with HIV infection. the main lesions in each group are listed in table below

Group 1-Lesions strengthly associated with HIV infections
Candidiasis
Erythematous
Hyperplastic
Pseudomembranous
Hairy leukoplakia (EB virus)
HIV associated periodental disease
HIV gingivitis
Necrotizing ulcerative gingivitis
HIV associated periodontotis
Necrotizing stomatitis
Kaposis sarcoma
Non-Hodgkins lymphoma
Group 2-lesions less commonly associated with HIV infections
Atypical ulceration
Ideopathic thrombocytopenic purpura
Salivary gland disorders
Dry mouth, decreased salivary flow rate
Unilateral or bilateral swelling of major glands
Viral infection other than (EB virus)
Cytomegalo virus
Human papilloma virus
Varicella zoster virus
Group 3-lesions possibly associated with HIV infection

Bacterial infections other than gingivitis/periodontitis

Fungal infection other than candidiasis

Melanotic hyperpigmentation

Neurologic disturbances

Facial palsy

Trigeminal neuralgia

Oral Manifestaton of Aquired immunodyficiency system (AIDS)

Persistent generalized lymphadenopathy.

HIV lymphadenitis may be seen in the HIV scale, later in the course of the disease lymph node biopsies may be necessary to rule out lymphoma

Candidiasis.

Oral candidiasis is the most common intra oral manifestation of HIV infection and often is the presenting sign that leads to the initial diagnosis, Its presence in a patient infected with HIV is not diagnostic of AIDS but appears to be predictive for the subsequent development of full-blown AIDS in untreated patients with in 2 years

The following four clinical patterns of oral candidiasis are seen;

- Pseudomembranous
- Erythematous
- Hyperplastic
- Angular cheilitis

HIV-associated periodontal disease. Three patterns of periodontal disease are associated strongly with HIV infection:

• Linear gingival erythema
• Necrotizing ulcerative gingivitis
• Necrotizing ulcerative periodontitis

Linear gingival erythema initially was termed *HIV" Iated gingivitis* but ultimately was noted in association with other disease processes. This unusual pattern of gingivitis appears with a distinctive linear band of erythema that involves the free gingival margin and extends 2 to 3 mm apically

Necrotizing ulcerative gingivitis (NUG)

Refers to ulceration and necrosis of one or more interdental papillae with no loss of periodontal attachment. Necrotizing ulcerative periodontis (NUP) was previously termed ***HIV-associated periodontitis****;* however, it has not been seemed to be specific for HIV infection. NUP is characterized by gingival ulceration and necrosis associated with rapidly progressing loss of periodontal attachment. Although severe cases can affect all teeth,

Herpes simplex virus (HSV).

Recurrent HSV infections occur in about the same percentage of HIV-infected patients as they do in the immunocompetent population (10% to 15%); however, the lesions are more widespread, occur in an atypical pattern, and may persist for months

Varicella-zoster virus (VZV).

Recurrent VZV infection (herpes zoster) is fairly common in HIV-infected patients, oral involvement often is severe and occasionally leads to bone sequestration and loss of teeth. Associated pain typically is in tense

***Epstein-Barr virus* (EBV).**

Although EBV is thought to be associated with several forms of lymphoma in HIV infected patients, the most common EBV-related lesion in patients with AIDS is oral hairy leukoplakia (OHL). This lesion has a somewhat distinctive (but not diagnostic) pattern of hyperkeratosis and epithelial hyperplasia that is characterized by white mucosal lesions that do not rub off.

Kaposi's sarcoma (KS).

KS is a multifocal neoplasm of vascular endothelial cell origin, KS begins with single or, more frequently. Multiple lesions of the skin or oral mucosa. the trunk. arms, head, and neck are the most commonly involved anatomic sites. Oral lesions are seen in approxtmately 50% of affected patients and are the initial site of involvement in 20% to 25%. Although any mucosal site may be involved, the hard palate, gingiva, and tongue are affected most frequently the neoplasm mean invade bone and create tooth mobility

Aphthous ulcerations.

Lesions that are similar clinically to aphthous ulcerations occur with increased frequency in patients infected with HIV. All three forms (minor, major, and herpetiform) are seen

Human papillomavirus (HPV).

HPV is responsible for several facial and oral lesions in immunocompetent patients. The most frequent of which are the verruca vulgaris ***(common* wart)** and oral squamous papilloma

Histoplasmosis.

Histoplasmosis is produced by *Histoplasma capsulatum*. In healthy patients. the infection typically is subclinical and self-limiting, but clinically evident infections do

occur in immunocompromised individuals. Although a number of deep fungal infections are possible in patients with AIDS

HIV-associated salivary gland disease.

Clinically obvious salivary gland disease is noted in approximately 5% of HIV-infected patients, with a greater prevalence noted in children. The main clinical sign is salivary gland enlargement, particularly affecting the parotid. Bilateral involvement is seen in about 60% of the patients with glandular changes and often is associated with cervical lymphadenopathy

Oral squamous cell carcinoma.

Squamous cell carcinoma of the oral cavity, pharynx, and larynx has been reported in HIV-infected patients.

ORAL PATHOLOGY

DEVELOPMENTAL DEFECTS OF THE ORAL AND MAXILLOFACIAL REGION

1- DEVELOPMENTAL DISORDERS OF TEETH.
2- DEVELOPMENTAL DEFECT OF THE ORAL MUCOSA.
3- DEVELOPMENTAL DEFECT OF THE TONGUE.
4- DEVELOPMENTAL DEFECT OF THE LIPS AND PALATE.
5- DEVELOPMENTAL DEFECT OF THE JAW BONES.
6- DEVELOPMENTAL CYST.

1- Developmental Disorders of Teeth

The development of teeth is regulated by genes, but the genetic program is very sensitive to disturbances in the environment such as *infection,* or *toxic chemicals*. The causes of developmental disorders of teeth are **multifactorial,** involving the interaction of genetic and environmental factors.
These disorders may be prenatal or postnatal in origin and may inherit or acquired.

Developmental Alterations of Teeth

1- Developmental alteration in the *size* of teeth.
2- Developmental alteration in the *number* of teeth.
3- Developmental alteration in the *shape* of teeth.
4- Developmental alteration in the *eruption* of teeth.
5- Developmental alteration in the *structure* of teeth.

1- Alteration in size of teeth

Microdontia

Generalized microdontia: all teeth in the dentition appear smaller than normal, as in ***pituitary dwarfism***, or they may be relatively small in comparison with a large mandible and maxilla.
Focal or localized microdontia: a single tooth is smaller than normal. The shape of these microdonts is also often altered with the reduced size. This phenomenon is most commonly seen with maxillary lateral incisors, in which the tooth crown appears cone or peg shaped, **(peg lateral).**
An autosomal-dominant inheritance pattern has been associated with this condition. Peg laterals are of no significance other than cosmetic

appearance. The second most commonly seen microdont is the **maxillary third molar**.

Macrodontia

Generalized macrodontia is characterized by the appearance of enlarged teeth throughout the dentition. This may be absolute, as seen in **pituitary gigantism**, or it may be relative owing to a disproportionately small maxilla and mandible. The latter condition results in crowding of teeth and possibly an abnormal eruption pattern because of insufficient arch space.

Focal, or localized, macrodontia: is characterized by an abnormally large tooth or group of teeth. This relatively uncommon condition is usually seen with **mandibular third molars.**

In the rare condition known as **hemifacial hypertrophy***,* teeth on the affected side are abnormally large compared with the unaffected side.

2- Abnormalities in number of teeth

A -Anodontia

B - Hypodontia

C -Additional teeth (hyperdontia)

Anodontia

Total lack of tooth development, total failure of development of a complete dentition **(anodontia)** is rare. If the permanent dentition fails to form, the deciduous dentition is retained for many years, but when these deciduous teeth become too much damaged by caries then they must be replaced by dentures or implants.

pseudoanodontia, when teeth are absent clinically because of impaction or delayed eruption; or as *false anodontia,* when teeth have been exfoliated or extracted.

Anodontia associated with systemic defects: Hereditary ectodermal dysplasia

In severe cases no teeth form. More often, most of the deciduous teeth form but there are few or no permanent teeth. The teeth are usually peg-shaped or conical. When there is anodontia, the alveolar process fails to develop and has too little bone to support implants because of lack of teeth support.

The profile of such patients then resembles that of an elderly person because of the gross **loss of vertical dimension**. The hair is fine and sparse. The skin is smooth, shiny and dry due to absence of sweat glands. Heat is therefore poorly tolerated. The finger nails are usually also defective.

To improve the patient's appearance and mastication fitting dentures is required, which are usually well tolerated by children.

Hypodontia

Failure of development of **one or two teeth** is relatively common and often hereditary. The teeth most frequently missing are **third molars, second premolars, or maxillary second incisors.**

Absence of these teeth may have little or no noticeable effect except,

1-Absence of third molars can be a disadvantage if first or second molars, or both, have been lost.

2- The absence of lower premolars worsens malocclusion if there is already disparity between an under developed mandible and a normal upper arch.

Other conditions associated with hypodontia:

There are many rare syndromes where hypodontia is a feature, but the only common one is **Down's syndrome.** One or more third molars are absent in over 90% of these patients. Absence of individual teeth scattered about the arch is also common.

Hyperdontia (Additional teeth)

Additional teeth are relatively common. They are usually of simple conical shape **(supernumerary teeth)** but less frequently resemble teeth of the normal series **(supplemental teeth).** These are the results of excessive but organized growth of the dental lamina of unknown cause.

Supernumerary teeth: Conical or malformed additional teeth, most frequently form in the **incisor or molar region** and very occasionally, in the **midline (mesiodens).**

Supplemental teeth:. Occasionally an additional **maxillary incisor, premolar** or, rarely, a **fourth molar** develops.

Effects and treatment:

Additional teeth usually erupt in abnormal positions, labial or buccal to the arch, creating stagnation areas and increasing susceptibility to caries. A supernumerary tooth may prevent a normal tooth from erupting. These additional teeth should usually be extracted.

Syndromes associated with hyperdontia:

The best known are Gardner’s syndrome and cleidocranial dysplasia where many additional teeth develop but fail to erupt.

Natal and neonatal teeth

Natal teeth: Erupted deciduous teeth present at birth.
Neonatal teeth: Deciduous teeth that erupt during the first 30 days of life. This is an artificial distinction, and it appears appropriate to call all of these teeth **natal teeth**, most are representing *premature portions of deciduous dentition.*

TREATMENT

If the teeth are mobile and at risk for aspiration, then removal is indicated. If mobility is not a problem and the teeth are stable, then they should be retained.

3- Developmental alteration in the shape of teeth

Gemination

It is the fusion of two teeth from a **single enamel organ.** The typical result is the appearance of two crowns that share the same root canal. Twinning occasionally occurs, resulting in two teeth from one tooth germ. The cause of gemination is unknown, but trauma has been suggested as a possible cause.

These teeth may be cosmetically unacceptable and may cause crowding.

Fusion

It is the joining of two developing tooth germs, resulting in a single large tooth structure. The fusion process may involve the entire length of the teeth, or it may involve the roots only, in which case cementum and dentin are shared. Root canals may also be separate or shared. The cause of this condition is unknown, although trauma has been suggested.

Gemination and Fusion appear similar and may be differentiated by assessing the number of teeth in the dentition.

Concrescence

It is a form of fusion in which the adjacent, already-formed teeth are joined by cementum. This may take place before or after eruption of teeth and is believed to be related to trauma or overcrowding. Concrescence is most commonly seen in **maxillary second and third molars.** This condition is of no significance, unless if one of the teeth involved requires extraction, surgical sectioning may be required to save the other tooth

Dilaceration

It is an *extraordinary curving or angulations of tooth roots.* The cause of this condition has been related to trauma during root development. Hereditary factors are believed to be involved in a small number of cases. Eruption generally continues without problems. However, extraction may be difficult, in addition, if root canal fillings are required in these teeth, the procedure is challenging.

Dens Invaginatus

Also known as ***Dens in Dente*** or ***tooth within a tooth***. It is an uncommon tooth anomaly that *represents an accentuation of the lingual pit*. This defect ranges in severity from superficial, in which only the crown is affected, to deep, in which both the crown and the root are involved. **The permanent maxillary lateral incisors** are most commonly involved. Bilateral involvement is commonly seen. The cause of this developmental condition is unknown. Genetic factors are believed to be involved in only a small percentage of cases.

Because the defect cannot be kept free of plaque and bacteria, dens invaginatus predisposes the tooth to early decay and subsequent pulpitis. Prophylactic filling of the pit is recommended to avoid this complication.

Dens Evaginatus

It is a relatively common developmental condition affecting predominantly **premolar teeth.**

The defect, which is often bilateral, *is a cusp, located in the center of the occlusal surface*. Because of occlusal abrasion, the tubercle wears relatively quickly, causing early exposure of an accessory pulp horn that extends into the tubercle. This may result in periapical pathology in young, caries-free teeth, often before completion of root development and apical closure, making root canal fillings more difficult.

Taurodontism

It is a variation in tooth form in which teeth have ***elongated crowns or apically displaced furcations***, resulting in pulp chambers that have increased apical-occlusal height. Taurodontism may be seen as an isolated incident, in families, and in association with syndromes such as Down syndrome and Klinefelter's syndrome. Diagnosis is made from radiographic appearance. **No** treatment is required.

Supernumerary roots

Accessory roots are most commonly seen **in mandibular canines**, **premolars, and molars** (especially third molars). They are rarely found in upper anterior teeth and mandibular incisors. Radiographic recognition of an extraordinary number of roots becomes important when extractions or root canal fillings are necessary.

Enamel Pearls

*Droplets of **ectopic enamel*,** or so-called **enamel pearls**, may occasionally be found on the roots of teeth. They occur most commonly in the **bifurcation** or **trifurcation of teeth** but may appear on single rooted premolar teeth as well. **Maxillary molars** are more commonly affected than are mandibular molars.

This developmental disturbance of enamel formation may be detected on radiographic examination. It is generally of little significance except when located in an area of periodontal disease. In such cases it may contribute to the extension of a periodontal pocket because a periodontal ligament attachment would not be expected and hygiene would be more difficult.

Accessory cusps

The cuspal morphology of teeth exhibits minor variations among different populations; of these:

(1) Cusp of Carabelli.
(2) Talon cusp.

When an accessory cusp is present, the other permanent teeth often exhibit a slightly *increased tooth size.*

Clinical and Radiographic Features

1-The cusp of Carabelli is an accessory cusp located on the palatal surface of the mesiolingual cusp of a maxillary molar. The cusp may be seen in the permanent or deciduous dentitions and varies from a definite cusp to a small indented pit or fissure. The cusp is most pronounced on the first molar.

2-Talon cusp A talon cusp (dens evaginatus of anterior tooth) is a well-delineated additional cusp that is located on the surface of an anterior tooth and extends at least half the distance from the cementoenamel junction to the incisal edge. Three fourths of all reported talon cusps are located in the permanent dentition.

4- Disorders of eruption

Eruption of deciduous teeth starts at about 6 months, usually with the appearance of the lower incisors, and is completed by about 2 years. Mass failure of eruption is very rare. More often eruption of a single tooth is prevented by local obstruction.

Local factors affecting eruption of deciduous teeth

Deciduous teeth usually erupt unobstructed. Occasionally an *eruption cyst* may overlie a tooth but is unlikely to block eruption.

Local factors affecting eruption of permanent teeth

A permanent tooth may be prevented from erupting or misplaced by various causes:

1- Loss of space (too early loss of a deciduous predecessor tends to cause irregularities because movement of adjacent teeth closes the available space)
2- Abnormal position of the crypt
3- Overcrowding
4- Supernumerary and supplemental teeth
5- Displacement in a dentigerous cyst
6- Retention of a deciduous predecessor

Primary Impaction and Ankylosis

Impaction: Impaction of teeth is a common event that most often affects the mandibular third molars and maxillary canines. Less commonly, premolars, mandibular canines, and second molars are involved. It is rare to see impactions of incisors and first molars. Impaction occurs because of obstruction from crowding or from some other physical barrier. Occasionally, it may be due to an abnormal eruption path, presumably caused by unusual orientation of the tooth germ.

Ankylosis, the fusion of a tooth to surrounding bone, is another cause of impaction. This usually occurs in association with erupted primary molars. It may result in impaction of a subjacent permanent tooth. The reason for ankylosis is unknown, but it is believed to be related to periapical inflammation and subsequent bone repair. With focal loss of the periodontal ligament, bone and cementum become inextricably mixed, causing fusion of the tooth to alveolar bone.

Delayed eruption associated with skeletal disorders

1- Cleidocranial dysplasia, in which there are typically many additional teeth but most of them fails to erupt.
2- Severe hereditary gingival fibromatosis, eruption may apparently fail merely because the teeth are buried in the excessive fibrous gingival tissue and only their tips show in the mouth **(pseudoanodontia).**
3-Cherubism: several teeth may be displaced by the proliferating connective tissue masses that containing giant cells and are prevented from erupting.

Treatment depends on the circumstances, but room may be made for the unerupted tooth by orthodontic means or extractions.
A retained deciduous tooth should be extracted if radiographs show a normal permanent successor. If a buried tooth partially erupts and becomes infected, it may have to be removed.

5- Defects of tooth structure

HYPOPLASIA AND HYPOCALCIFICATION

They are represented by minor structural defects of the teeth, such as pitting or discolouration. Hypoplasia of the teeth is not an important cause of dental caries; indeed, hypoplasia due to fluorosis is associated with enhanced caries resistance. The main clinical requirement is usually cosmetic improvement.

Defects of deciduous teeth:

Calcification of deciduous teeth begins about the fourth month of intrauterine life. Disturbances of metabolism or infections that affect the fetus at this early stage without causing abortion are rare. Defective structure of the deciduous teeth is therefore uncommon, but in a few places such as parts of India, where the fluoride content of the water is excessively high, the deciduous teeth may be mottled.

Defects of permanent teeth:

Single permanent teeth may be malformed as a result of local causes such as periapical infection of a predecessor (Turner teeth) or multiple teeth by systemic diseases as:

*Genetic:

1- Amelogenesis imperfecta
A- Hypoplastic (type 1)
B- Hypomaturation (type 2)
C- Hypocalcified (type 3)
2- Dentinogenesis imperfecta
Shell teeth
3- Dentinal dysplasia
4- Regional odontodysplasia
5- Multisystem disorders with associated dental defects
***Infective:** Congenital syphilis
***Metabolic:** Childhood infections, rickets, hypoparathyroidism
***Drugs:** Tetracycline pigmentation, Cytotoxic chemotherapy, Fluorosis

1-Amelogenesis imperfecta

Etiology

Intrinsic enamel defect that affects all teeth of both dentitions
Results from defective *amelogenin genes on X and Y chromosomes and also chromosome 4*
At least 16 variants noted based upon inheritance pattern, enamel qualities, and radiographic features.

Clinical Presentation

One of three basic alterations of enamel may be seen: **hypoplasia, hypomaturation, or hypocalcification**
Enamel hardness varies depending upon type of defect:
normal hardness in hypoplastic form but deficient amounts of enamel; **soft enamel in the hypocalcified variant** but normal amounts of enamel
Color ranges from **normal (hypoplastic)** to **dark yellow-brown (hypocalcified)**
Radiographic changes range from **normal density (hypoplastic)** to **less dense (hypocalcified)**

Diagnosis

1-Clinical and radiographic features
2-Family history (autosomal, X-linked forms)

Treatment

1-Full-crown restorations for esthetics
2-Genetic counseling

2-Dentinogenesis Imperfecta

Etiology

Hereditary disorder of dentin (autosomal dominant) . It may be seen in association with osteogenesis imperfecta. Altered dentin matrix is related to the defective degradation of dentin phosphoprotein during dentinogenesis

Clinical Presentation

Primary and permanent dentition exhibit gray to brownish opalescence
Normal enamel fractures easily from defective underlying Dentin.
Severe tooth abrasion related to exposed dentin following enamel loss

Radiographically: roots are slender to spike with pronounced cervical constriction and obliterative pulpal calcification. Constricted tooth cervix gives molar crowns a "tulip" profile.

Diagnosis

1-Clinical and radiographic appearance
2-Family history

Differential Diagnosis

Osteogenesis imperfecta

Treatment

Functional and esthetic restorations (full crowns)
Genetic counseling

Shell teeth (dentinogenesis imperfecta type 3)

This rare anomaly is so called because only a thin shell of hard dental tissue surrounds overlarge pulp chambers. Like other types of dentinogenesis imperfecta there is normal, but thin, mantle dentine which covers irregular dentine. The pulp lacks a normal odontoblast layer and consists of coarse connective tissue which becomes incorporated into the deep surface of the dentine.

3-Dentinal dysplasia ('rootless' teeth)

In dentinal dysplasia, the roots are very short and conical. The pulp chambers are obliterated by multiple nodules of poorly organized dentine containing sheaves of tubules; these teeth tend to be lost early in life.

4-Regional odontodysplasia (ghost teeth)

This is a localized disorder of development affecting a group of teeth in which there are severe abnormalities of enamel, dentine, cementum and pulp. The disorder is not hereditary and the etiology is unknown. There is no sex or racial predilection.

Clinically, regional odontodysplasia may be recognizable at the time of eruption of the deciduous teeth (2 to 4 years) or of the permanent teeth (7 to 11 years). **The maxillary teeth** are most frequently affected, two quadrants may be affected. The abnormal teeth frequently fail to erupt, but if they erupt, show yellowish deformed crowns, often with a rough surface. In addition they are susceptible to caries and fracture. Affected teeth have very thin enamel and dentine surrounding a greatly enlarged pulp chamber.

In radiographs, the teeth appear crumpled and abnormally radiolucent or hazy, due to the decrease in mineralization of dental hard tissues, hence they are called **ghost teeth'**.

Treatment

If affected teeth can be preserved and restored, crown and root dentine continue to form and the teeth may survive long enough to allow normal development of the alveolar ridge and occlusion. However, extraction is often required.

Disturbance affecting cementum structure

Cementum is continuously formed with life either with age or to compensate for occlussal wears. Sometimes we may have:

1-Hypercementosis (excess deposition of cementum in root area) lead to increase the thickness of the root and ankylosis and this will lead to difficult extraction , **or we may have**

2- **Hypocementosis** this will lead to loss of attachment to the surrounding bone, mobile teeth and then early loss of teeth.

Post developmental loss of tooth structure (enamel, dentin and cementum)

Enamel can be lost by attrition, abrasion and erosion

Attrition: It is the **physiologic wearing of teeth** as a result of mastication. It is an age-related process and varies from one individual to another. Factors such as diet, dentition, jaw musculature, and chewing habits can significantly influence the pattern and extent of attrition.

Abrasion: it is the **pathologic wearing of teeth** as a result of an abnormal habit or abnormal use of abrasive substances orally. Pipe smoking, tobacco chewing, aggressive tooth brushing, and use of abrasive dentifrices are among the more common causes. The location and pattern of abrasion are directly dependent on the cause; with the so-called tooth-brush abrasion is localized along the cemento-enamel junction is an easily recognized pattern.

Erosion: it is the loss of tooth structure from a **nonbacterial chemical process**. Most commonly, acids are involved in the dissolution process from either an external or an internal source. **Externally,** the acid may be found in the work environment (e.g., battery manufacturing) or in the diet (e.g.,citrus fruits and acid-containing soft drinks).

The internal source of acid is most probably from regurgitation of gastric contents. This may be seen in any disorder in which chronic vomiting is a part. The pattern of erosion associated with vomiting is usually generalized tooth loss on the lingual surfaces of maxillary teeth

In addition to these conditions

Dentin can be lost due to internal resorption

Cementum can be lost by external resorption

Environmental discoloration of teeth

A-Exogenous or extrinsic stains: These are the Stains on the surface of teeth that can be removed with abrasives. The color change may be caused by

1- Pigments in dietary substances (e.g., coffee, "betel" areca nut, tobacco).

2- By-products of chromogenic bacteria in dental plaque. Chromogenic bacteria are believed to be responsible for brown, black, green, and orange stains observed predominantly in children.

3- Blood pigments

4- Restorative materials.

5- Medications (iron and iodine containing drugs).

These are generally easily removed.

B-Endogenous or intrinsic staining

Discoloration of teeth resulting from deposits of systemically circulating substances during tooth development

1- **Amelogenesis imperfecta(A.I.).**

2-**Dentinogenesis imperfecta(D.I.).**

3- **Dental flourosis.**

4- **Hyper bilirubnemia**. Rh incompatibility (erythroblastosis fetalis) has been cited as a cause of endogenous staining in primary teeth. Because of red blood cell hemolysis resulting from maternal antibody destruction of fetal red blood cells, blood breakdown products (bilirubin) are deposited in developing primary teeth. The teeth appear green to brown. No treatment is required, because only primary teeth are affected.

5- **Drugs (Tetracycline).** Tetracycline binds calcium and therefore is deposited in developing teeth and bones. The drug's bright yellow color is reflected in the subsequently erupted teeth. Because tetracycline can cross the placenta, it may stain primary teeth if taken during pregnancy. If it is administered after birth and between age 6 or 7 years, permanent teeth may be affected.

ORAL PATHOLOGY

Vesiculobullous Diseases

This group of lesions are immune mediated, characterized by the eruption of vesicles and bullae affecting the oral mucosa and skin. These lesions are caused by the production of **autoantibodies** by the body directed against various constituents that **hold epithelial cells together, or that bind the epithelial surface to the underlying connective tissue.** The resultant damage produced by the interaction of these autoantibodies with the host tissue is seen clinically as a disease process termed as **immuno-vesiculobullous diseases.**

Pemphigus

Pemphigus is a group of autoimmune mucocutaneous diseases characterized by **intraepithelial blister** formation. It results from a breakdown or loss of intercellular adhesion, thus producing epithelial cell separation known as **acantholysis.** Widespread superficial ulceration following rupture of the blisters leads to painful debilitation, fluid loss, and electrolyte imbalance. Before the use of corticosteroids, death was a common outcome for patients with pemphigus vulgaris.

Four types of pemphigus are recognized:

1- **pemphigus vulgaris**
2- **pemphigus vegetans**
3- **pemphigus erythematosus**
4- **pemphigus foliaceus**

These differ in the level of intraepithelial involvement in the disease; pemphigus vulgaris and pemphigus vegetans affect the whole epithelium, and pemphigus foliaceus and pemphigus erythematosus affect the upper prickle cell layer/spinous layer.

Only pemphigus vulgaris and pemphigus vegetans involve the oral mucosa. Pemphigus vegetans is very rare and generally is considered a variant of pemphigus vulgaris.

Pemphigus Vulgaris: (PV)

Is the most common among this group. It is a chronic vesiculobullous disease of the skin and oral mucosa. It is a serious condition because if untreated, often results in patient's death. Furthermore, the oral lesions are often the first sign of the disease.

In this disease there is epithelial desquamation due to autoantibodies that attack the desmosomes of the intercellular cohesive system, as a result loss of adhesion occurs between the cells located in the zone above the basal cell layer and leads to suprabasilar bullous formation. Destruction of the adhesive factors of the suprabasilar spinous cells referred to as **acantbolysis.**

Clinically: PV affects patients in 40-60 years old. The initial manifestations, involve the oral mucosa. Patients usually complain from oral soreness, examination showed superficial, ragged erosions and ulcerations haphazardly distributed on the oral mucosa. The lesions affect any oral mucosa location, although the **palate, labial mucosa, ventral tongue and gingivae are often involved**. Vesicles and bullae rarely seen by the clinician because of early rupture of the **thin, friable roof of the blisters.**

The skin lesions appear as flaccid bullae, that rapture quickly, usually within hours to a few days, leaving an erythematous denuded surface.

Without proper treatment the oral and cutaneous lesions tend to persist and progressively involve more surface area. A characteristic feature of PV is that the bulla can be induced on normal-appearing skin if firm lateral pressure is exerted. This phenomenon is called a positive **Nikcolsky sign.**

Histopathologic features: Microscopic appearance of PV exhibits epithelium of normal thickness. Mild inflammation is found in the underlying C.T. The basal cell layer is intact but the cells of the suprabasilar layer are separated **(acantholysis)** and float freely in a fluid-like intraepithelial space. The cells lose their polygonal shape and become rounded with less cytoplasm visible around the nucleus. These cells are named as **Tzanck cells** and are characteristic finding in the intraepithelial split in PV.

Immunoflourescenece is a valuable aid in the diagnosis of PV. the test reveals the presence of **IgG Ab in a fishnet pattern** due to its attachment to the periphery of the cells in the spinous layers of the epithelium.

Treatment: Treatment is aggressive and requires a prolonged high dose of corticosteroid (prednisolone) in a range of 150-360mg daily for 6-10 weeks. Then the dose is reduced and it is usually used in combination with other non- steroid immunosuppressant drug such as azathioprine. Gradual reduction of corticosteroid drugs is required after cure to reduce the risk of complication of this therapy .Before the **development** of corticosteroids. 60-80% of patients die as a result of infection, protein loss and electrolyte imbalance from the extensive skin vesiculobullous rupture and ulcerations

Mucous Membrane Pemphigoid(MMP): Cicatritial pemphigoid(CP):

A desquamating condition of the mucous membrane in which the autoimmune reaction occurs **at a level of the basement membrane and commonly** affects the gingiva,before extending to other mucosal locations.

The patient suffers from involvement of the mucous membrane of the eyes that result in scar formation **(cicatrix)** leading to a **(symblepharon)** formation of the eyes, and accordingly, the condition is termed by the dermatologists as **Cicatritial pemphigoid** ,and nasal mucosal lesions in addition to oral lesions. Occasionally, patient develops skin lesions mostly on head and neck areas.

In any involved area there is atrophy of epithelium followed by separation from C.T at the level of B.M. If the disease involve the oral mucosa only it is termed as **mucous membrane pemphigoid.** When the disease restricted to the gingiva it is called **Desquamative gingivitis.**

Clinical features: Cicatritial pemphigoid usually affects adults of an average age 50-60 years, females are affected most commonly than males. Oral lesions are seen in most patients, but other sites, such as conjunctival, nasal

esophageal, laryngeal as well as skin may be involved.

The oral lesions begin as vesicles or bullae mat may be identified clinically in contrast to pemphigus. The explanation to this difference is that pemphigoid **blisters forms in a subepithelial location, producing a thicker, stronger roof than intraepithelial acamhoiytic pemphigus blisters.** Eventually, vesicles rupture, leaving large superficial ulcerations. The ulcerations are usually painful and persist for weeks to months if untreated.

Histologic features: The antibodies directed toward the BM and cause **separation or splitting of epithelium from underlying C.T** to form **subepithelial vesicle or bulla,** there is no evidence of acantholysis, also there is chronic inflammatory cells infiltration in the C.T.

Diagnosis: The major goal in diagnosing MMP is to differentiate it from PV and this depend on :

1- History and clinical features.
2- Histopathology
3- Direct immunoflourescence study shows a continuous **linear band of IgG and C3 localized at the basement membrane zone.**

Treatment: Systemic immunosuppressive therapy. Prednisolone daily dose combined with azathioprine.

Bullous Pemphigoid

Bullous pemphigoid and its closely related mucosal counterpart, MMP, appear to share similar **etiologic and pathogenetic factors.** A difference from MMP is that titers of circulating autoantibodies to basement membrane zone antigens are usually detectable in bullous pemphigoid by routine methods.

Clinical Features.

This bullous disease is seen primarily in the elderly, with peak incidence in the seventh and eighth decades. Lesions characteristically appear on the skin, although concomitant lesions of mucous membranes occur in approximately one third of patients.

Skin lesions are characterized by a **trunk and limb distribution.** Tense vesicles and bullae are typically noted in contrast to flaccid bullae of pemphigus vulgaris . Oral mucosal lesions of bullous pemphigoid cannot be

distinguished from those of MMP. Bullae and erosions may be noted, especially on the **attached gingiva**, a commonly affected site. Other areas of involvement may include the soft palate, buccal mucosa, and floor of the mouth.

Histopathology and Immunopathology

Bullae are subepithelial and appear similar to those of MMP. Ultrastructurally, the basement membrane is cleaved at the level of the lamina lucida. Direct immunoflourescence shows linear deposition of **IgG and C3 along the basement membrane zone.**

Epidermolysis Bullosa (EB):

Is a general term that describes a heterogenous group **one acquired** and **several genetic (inherited)** mucocutaneous varieties, each has a specific defect in the attachment mechanisms in the epithelial cells, **either to each other**, or to the **underlying connective tissue**, that are basically characterized by the formation of vesicles and bullae at the site of minor trauma.

The acquired is termed **Epidermolysis aquisita.** It is unrelated to other types and precipitated by exposure to **specific drugs**. In this type, **IgG antibodies** directed against **type VII collagen** of the anchoring fibrils.

The genetic types are **(Simplex, Junctional &Dystrophic)**.These types range from **Autosomal dominant** to **autosomal recessive** in origin. In these types circulating antibodies are **not** evident. But there are **genetic defects** in basal cells, hemidesmosoms or anchoring C.T filaments depending on the disease subtype.

Clinical Features:

- Common features to all subtypes of EB is bulla formation from minor trauma usually over areas of stress such as the elbows or knees.
- In hereditary forms the onset of disease is during infancy or early childhood, in acquired type, the onset during adulthood.
- Oral lesions are common and severe in inherited types and uncommon in the

Acquired type.

- Blisters may be widely spread and severe and may result in scarring and atrophy. Nails may be dystrophic in some forms of this disease.
- The oral lesions include bulla that heal with scar formation, a Constricted oral orifice resulting from scar contracture and hypoplastic teeth.

Treatment & Prognosis:

Prognosis depend on the subtype of EB, ranging from life threatening in the(junctional subtype) to debilitating in the other forms.

Therapy includes avoidance of trauma, supportive measures and chemotherapeutic agents.

ORAL PATHOLOGY
DEVELOPMENTAL DEFECTS OF THE ORAL AND MAXILLOFACIAL REGION

2-Developmental Defects of the Oral Mucosa

1- FORDYCE'S GRANULES

They represent ectopic sebaceous glands which are present in the oral mucosa in at least 80% of adults, particularly in elderly people. They grow in size with age and appear in the oral mucosa as soft, symmetrically distributed, creamy spots a few millimetres in diameter. The **buccal mucosa** is the main site, but sometimes the lips and rarely, even the tongue is involved.

These glands are sometimes mistaken for disease but patients can be reassured that they are of **no significance.** If a biopsy is carried out it shows a normal sebaceous gland with two or three lobules.

2- LEUKOEDEMA

Leukoedema is a bilateral, diffuse, translucent greyish thickening, particularly of the **buccal mucosa**. It is a variation of normal, present in 90% of blacks and variable numbers of whites.

Histologically, there is thickening of the epithelium with intracellular oedema of the spinous layer

Treatment is unnecessary but reassurance may be required.

3- WHITE SPONGE NAEVUS

A developmental anomaly inherited as an autosomal dominant trait.

Clinical features:

The affected mucosa is white, soft and irregularly thickened. The abnormality is **usually bilateral** and sometimes involves the whole oral mucosa. There are no defined borders and the edges fade into normal tissue. The anus and vagina can also be affected.

No treatment is required only reassurance.

The retrocuspid papilla

A 2 to 4 mm slightly raised area of mandibular alveolar mucosa located lingual to the cuspids, between the marginal gingiva and the mucogingival junction. It is commonly bilateral but can also be unilateral, and it is prominent in children. Because reterocuspid papilla is commonly bilateral

and has a very specific location, it is logical to assume that it represents a normal anatomic structure.

Histologically: a mass of vascular connective tissue with numerous large stellate fibroblast (with several nuclei) in the superficial connective tissue. No treatment is required.

3- Developmental defects of the tongue

1- Macroglossia It is an abnormaly large tongue, it could be congenital or acquired.

Congenital macroglossia e.g. Down's syndrome, Congenital haemangioma or lymphangioma .

Acquired macroglossia e.g. Cretinism, Acromegaly, Amyloidosis, Lingual thyroid, Cancer.

2- Microglossia:

It is an abnormally small tongue. It is uncommon, but mostly associated with a group of overlapping conditions known as (oromandibular-limb hypogenesis syndrome) which is characterized by limb abnormalities like absence of digits.

3- Hairy tongue

The **filliform papillae** can become elongated and hair-like forming a thick fur on the dorsum of the tongue. The filaments may be up to half a centimetre long and pale brown to black in colour. Adults are affected but the cause is unknown. Heavy smoking, excessive use of antiseptic mouth washes and defective diet has been blamed, but their effect is questionable. The discoloration is probably caused by pigment-producing bacteria and fungi but **not *Candida albicans***.

Treatment

It is difficult. The measure most likely to succeed is to persuade the patient to scrape off the hyperplastic papillae and vigorously clean the dorsum of the tongue with a firm toothbrush. This removes large numbers of microorganisms mechanically and also, by removing the overgrown papillae, makes conditions less favorable for their proliferation.

4- Black tongue

The dorsum of the tongue may sometimes become black without overgrowth of the papillae. This may be staining due to drugs such as iron compounds used for the treatment of anemia, but is then transient. Occasionally the

sucking of antiseptic lozenges causes the tongue to become black, and this may be due to pigment producing organisms, particularly Bacteroides strains.

5-FISSURED TONGUE (SCROTAL TONGUE)

Fissured tongue is relatively common. Numerous grooves. or fissures. are present on the dorsal tongue surface. The cause is uncertain, but heredity appears to play a significant role. Aging or local environmental factors also may contribute to its development. Fissured tongue also may be a component of ***Melkersson Rosenthal syndrome.***

6- Furred tongue

The tongue becomes coated with desquamating cells and debris, in those who smoke heavily, in many systemic upsets, especially of the gastrointestinal tract, and infections in which the mouth becomes dry and little food is taken. A furred tongue is often seen in the childhood fevers, especially scarlet fever.

7-Lingual varicositis

Dilated tortuous veins may be seen along the ventral surface of the tongue and tend to become more prominent with age. They may be noticed by patients who need to be reassured that they are not abnormal.

8- Geographical tongue (erythema migrans linguae)

It is the recurrent appearance and disappearance of red areas on the tongue. The cause is unknown but sometimes there is a clear family history of its presence in several generations. In many patients geographical tongue seems to be a developmental anomaly but there also appears to be an association with psoriasis.

Clinically: an irregular, smooth, red area appears, usually with a sharply-defined edge. It extends for a few days, and then heals, only to appear again in another area. Sometimes the lesion is annular with a slightly raised pale margin, and several of these areas may coalesce to form a scalloped pattern. Most patients have no symptoms but some adults complain of soreness.

Histologically: there is thinning of the epithelium in the centre of the lesion with mild hyperplasia and hyperkeratosis at the periphery, there are chronic inflammatory cells in the underlying connective tissue. Sometimes the changes are the same as those of psoriasis.

The Condition is considered important, because it can be confused with more serious form of **glossitis and even premalignant or malignant lesions.**

9- Ankyloglossia

It is characterized by a **short, thick lingual frenum** resulting limitation of tongue movement. The frenum sometime extends forward and attach to the tip of the tongue and there may be a slight clefting of the tongue. Occasionally, high mucogingival attachment of the lingual frenum may lead to local gingival and periodontal diseases in the regional frenal attachment.

10- Lingual thyroid nodule:

1- Accessory accumulation of thyroid tissue within the body of posterior tongue.
2- It represents a thyroid remnant in the region of the thyroid gland origin.
3- More common in females apparent during puberty and adolescence.
4- 2-3 cm, smooth, sessile mass on mid –posterior dorsum of the tongue in the region of foramen caecum.
5- Symptoms include dysphagia, dysphonia and hypothyroidism.

11- Cleft tongue: - disunion of tongue usually occurs due to failure of fusion of the two lateral part of the tongue (mainly anteriorly) and this will lead to bifid tongue or cleft tongue.

4- DEVELOPMENTAL DEFECTS OF THE LIPS AND PALATE

1-Orofacial clefts:

A- Cleft lip and palate:

Clefts can form in the lip or palate alone or in both. The aetiology is unknown but there is a genetic component in approximately 40% of cases. The risk of having such defects is greatly increased if one, and particularly if both, of the parents are affected.

Cleft lip: Developing defect usually of the upper lip characterized by a wedge-shaped defect resulting from the failure of two parts of the lips to fuse into single structure. Cleft lip (with or without a palatal cleft) is **more common in males**, while cleft palate alone is approximately twice **as common in females**. The incidence of cleft lip is about 1 per 1000 live births, while that of isolated palatal clefts is about 1 per 2000 live births.

In terms of relative frequencies, cleft lips form about 22%, combined defects of lip and palate form about 58% and isolated palatal clefts form about 20% of this group of defects. **The reason for the variations in the sites of clefts is that the lip and anterior palate (the primary palate) develop before the hard and soft palates (the secondary palate).**

Fusion of the secondary palate is from behind forwards. Isolated cleft lip is therefore the result of an early developmental disorder, while isolated cleft palate results from influences acting later, after the primary palate has closed. By contrast, a prolonged disorder of development can prevent both primary and secondary palates from closing and leaves a severe combined defect.

Classification

The main types of cleft lip and palate are:-

1- Cleft lip

Unilateral (usually on the left side), with or without an anterior alveolar ridge cleft

Bilateral, with or without alveolar ridge clefts, complete or incomplete

2- Palatal clefts

Bifid uvula, Soft palate only, both hard and soft palate

3- Combined lip and palatal defects

Unilateral, complete or incomplete

Cleft palate with bilateral cleft lip, complete or incomplete

In the worst cases there is complete separation of the anterior palate, which projects forward with the centre section of the lip and is attached only by the nasal septum.

Enveromental factors: - include

1- Physiologic, emotional or traumatic stress.
2- Nutritional deficiency or excess of vitamin A and Riboflavin deficiency.
3- Mechanical obstruction by large tongue.
4- Relative ischemia to the area.
5- Substances like, alcohol, drugs and toxins.
6- Infections.

B- Oblique facial cleft:-

It represents failure of fusion of the lateral nasal process with the maxillary process. It extends from the upper lip to the eye and always associated with cleft palate.

C- Lateral facial cleft:-

It results from lack of fusion of the maxillary and mandibular processes. Occurs as isolated defects or may be associated with other disorders as mandibular dysostosis. It is either unilateral or bilateral extending from the commissures toward the ear resulting in macrosomia.

2- Double lip: - this anomaly characterized by a horizontal fold of redundant mucosal tissue that is usually located on the inner aspect of the upper lip. Most often congenital in nature, but it may be acquired later in life.

3- Congenital lip pits: - developmental defects that may involve the Para median portion of the vermilion of the lower and upper lip **(Para median lip pit),** or the labial commissural area (commissural lip pit).

Para median lip pit: present as bilateral and symmetric fistulas on either side of the midline of the vermilion of the lower lip. It occurs as an isolated condition or may be associated with cleft lip or cleft palate.

Commissural lip pits: A small mucosal invagination that occur at the corner of the mouth on the vermilion border. It may represent a failure of fusion of the maxillary process and mandibular process. It is either unilateral or bilateral.

Clinically it represents as blind fistula that may extend to a depth of 1-4 mm or it may be present as dilated ectopic salivary gland tissue.

5- DEVELOPMENTAL DEFECTS OF THE JAW BONES

1- BONY OVERGROWTHS(Bony exostosis)

Localised overgrowths of bone that arises from normal cortical plate (exostoses) are more common.

Small exostoses may form irregularly on the surface of the alveolar processes and specific variants are **torus palatinus** and **torus mandibularis**. They differ from other exostoses **only in that they develop in characteristic sites and are symmetrical.**

Torus palatinus commonly forms towards the posterior of the midline of the hard palate. The swelling is rounded and symmetrical, sometimes with a midline groove. It is not usually noticed until middle age and, classified according to their morphology into:

1- Flat torus which have broad base.
2- Spindle torus appears as a midline ridge.
3- Nodular torus appears as multiple protuberances.
4- Lobular torus appears as lobulated mass arises from single base.

It should be removed, if it interferes with the fitting of a denture.

Torus mandibularis form on the lingual aspect of the mandible opposite the mental foramen. They are typically bilateral, forming hard, rounded swellings. The management is the same as that of torus palatinus.

2- Agnathia:- (nathia= jaw, Ag = Agenesis).

It is developmental congenital absence of one of the jaws; it is a rare condition and mostly occurs as part of the mandible is absent.

3- Macrognathia:-

It is abnormally large jaw, some times called prognathism. This defect occurs either due to local cause, e.g. fibrous dysplasia of bone, reactive or neoplastic bone tumor, odontogenic cysts and tumors or associated with systemic diseases as Acromegaly and Pagets disease of bone.

4- Micrognathia:- very small jaw

It is a developmental disturbance affecting one of the jaws and lead to abnormally small jaw. The condition gives rise to numerous dental problems.

Micrognathia may be associated with other developmental defect like in Pierre Rboins syndrome which is characterized by cleft palate, micrognathia and glossoptosis (posterior displacement of the tongue, lack of support of tongue musculature and airway obstruction).

5- Coronoid hyperplasia:-

It is rare developmental anomaly which results in limitation of mandibular movement. The condition may be **unilateral** which result from osteoma and osteosarcoma or **bilateral** which may result from endocrine influence during puberty.

6- Condylar hyperplasia:-

Excessive growth of one condyle is of unknown cause but local circulatory problems, endocrine disturbances and trauma have been suggested as possible etiological factors.

7- Condylar hypoplasia:-

Congenital: - associated with mandibulofacial dysostosis and hemifacial macrosomia.

Aquired: - result from disturbance of growth center of the developing condyle secondary to trauma, radiation or rheumatoid arthritis.

8- Bifid condyle:-

Double-headed mandibular condyle of uncertain cause.

Anteroposterior bifid condyle may be traumatic in origin during childhood.

Mediolateral bifid condyle may result from abnormal muscle attachment.

9- Hemifacial hypertrophy:

Significant unilateral enlargement of the face as a result of an increased neurovascular supply to the affected side of the face.

Unilateral enlargement of the facial tissues, bones and teeth is usually present resulting in asymmetry of the face with malocclusion and deviation of the affected side of the face to the unaffected side of the face.

10- Hemifacial atrophy:-

Uncommon poorly understood degenerative condition, characterized by:

1- Atrophic changes affecting one side of the face.
2- The mouth and nose are deviated toward the defective side.
3- The covering skin often exhibit dark pigmentation.

11- Lingual mandibular salivary gland depression (Stafne defect)

Developmental concavity of the cortex of the mandible in the molar area, that forms around an accessory lateral lobe of submandibular gland which has **radiographical appearance** of a **well-circumscribed cystic lesion** within the bone usually below the inferior alveolar canal.

In most cases biopsy revealed **histologically normal salivary gland** tissue suggesting that these lesions represent developmental defects containing portion of the submandibular gland.

12- Mandibular Dysostosis(Treacher-Collins syndrome)

Autosomal dominant disorder characterized by:-

1- Hypoplastic zygoma, resulting in narrow face with depressed check and downward slanting of palpubral fissures.
2- Underdeveloped mandible with retruded chin and cleft palate may be seen.

13- Cleidocranial Dysplasia or Dysostosis

It is rare familial disorder characterized by defective formation of the clavicles, delayed closure of fontanels and sometimes retrusion of the

maxilla. Partial or complete absence of clavicles allows the patient to bring the shoulders together in front of the chest.
This disorder is one of the few recognizable causes of delayed eruption of the permanent dentition. Many **permanent teeth may remain embedded** in the jaw and frequently become enveloped in dentigerous cysts. **Supernumerary teeth** may be seen **radiographically.**

Oral pathology

Periapical Pathology

Inflammation in the periapical part of the periodontal ligament is similar to that occurring elsewhere in the body, but, because of the confined space within which the process develops; a particular feature of inflammation in this site is that the adjacent bone and occasionally the root apex may resorb. However, the periapical tissue heals, if the cause of inflammation is removed.

This potential for complete periapical healing, providing the source of irritation is removed, is the basis of endodontic treatment. The periapical periodontitis is different from pulpitis in the following:

1-the periapical periodontitis differs markedly from pulpits where the potential for healing is very limited.

2-the symptoms are also different in that they are generally well located by the patient to a particular tooth, due to the presence of the properioceptive nerve ending in the periodontal ligament.

Numerous sequelae may follow untreated pulp necrosis and are dependent on the nature and behavior of lesions that form at the apex of the tooth.

The factors which may affect these lesions are

1-the presence of open or closed pulpitis.

2-virulence of the involved micro organisms.

3-extent of sclerosis of the dentinal tubules.

4-competency of the host immune response of the individual.

Where these factors are optimal e.g. the presence of an open chronic pulpitis, bacteria of few virulence, and an older tooth with sclerotic dentinal tubules in a healthy ((immune component)) individual, the changes at the apex of the tooth are mild and chronic.

Where the conditions are mostly adverse e.g. the presence of a closed acute pulpitis, large numbers of highly virulent bacteria, and open dentinal tubules of young teeth, the inflammation at the apex of the tooth will rapidly intensify and large amounts of bacterial toxins and autolytic enzymes will be produced and disseminated leading to rapid destruction of the periapical tissue and the surrounding bone ((e.g. acute periapical abscess)).

From its origin in the pulp, the inflammatory process extends into the periapical tissues, where it may present as a granuloma or cyst (if chronic) or an abscess (if acute). Acute exacerbation of a chronic lesion may also be seen.

Aetiology of periapical periodontitis

1-Pulpitis and pulp necrosis:

If pulpitis is untreated, bacteria, bacterial toxins and the product of inflammation will extend down the root canal and through the apical foramina to cause periodontitis.

2-Trauma:

Occlusal trauma either from a high restoration or less frequently associated with bruxism, may result in periapical periodontitis under pressure during orthodontic treatment, a direct blow on tooth insufficient to cause pulp necrosis and biting unexpectedly on a hard body in food may all cause minor damage to the periodontal ligament and localized inflammation.

Endodontic treatment

Mechanical instrument through the apex during endodontic treatment as well as chemical irritation from root filling material may result in inflammation in the periapical periodontium. Instrumentation of an infected root canal may be followed by periapical inflammation, due to bacterial proliferation in the root canal or due to bacteria being forced into the periapical tissues.

1-Chronic apical periodentitis (periapical granuloma)

The term periapical granuloma refers to a mass of chronically or sub acutely inflamed granulation tissue at the apex of a non-vital tooth. The term is not totally accurate because the lesion does not show true granulomatous inflammation microscopically. The formation of the periapical granuloma represent a definitive reaction secondary to the presence of microbial infection in the root canal with spread of related toxic products into the apical zone.

In the early stages of infection, neutrophils predominate, and radiographic changes are not present, this phase of periapical inflammation is termed acute periapical periodontitis.

The neutrophils release prostaglandins which activate osteoclaststo resorb the surrounding bone leading to detectable periapical radiolucency. With time, chronic inflammatory cells begin to dominate the host response. Mediators released by lymphocytes reduce further osteoclastic acivity while also stimulating fibroblast and microvasculature.

For this reason chronic periapical granuloma is often asymptomatic and demonstrates little additional changes radiographically.

Clinical features

1-most of periapical granulomas are asymptomatic.

2-pain may develop if acute exacerbation occurs.

3-typically the involved tooth does not demonstrate mobility or significant sensitivity to percussion.

4-the soft tissue overlying the apex may or may not be tender

5-the tooth does not respond to thermal or electric pulp tests unless the pulp necrosis is limited are limited to a single canal in a multirooted tooth.

Radiographic features

Most lesions are discovered on routine radiographic examination which may show:

1-variable radiolucenies ranging from very small to 2 cm in diameter

2-affected teeth typically reveal loss of the apical lamina dura

3-the lesion may be circumscribed or ill defined and may or may not demonstrate a surrounding radiopaque rim

4- root resporption may be seen

The radiographic features are suggested but not diagnostic

Histopathological features

Periapical granulomas consist of an inflamed granulation tissue surrounded by fibrous connective tissue wall. The central part of the lesion contains macrophages with foamy cytoplasm caused by the phagocytosis of cholesterol.

Cholesterol crystals may be present surrounded by multinucleated giant cells. A diffuse infiltrate of lymphocytes and plasma cells. When numerous plasma cells are present, scattered eosinophilic globules of gamma globulin (Russell bodies) may be seen. A frequent finding is the presence of irregular islands of

epithelium, a result of prolonged, mild stimulation of the rest malassez, which are remnants of the Hertwig root sheath.

Treatment and prognosis

Periapical granuloma represents about 75% of apical inflammatory lesions and 50% of these failed to respond to conservative endodontic measures.

Treatment depend on the reduction and control of the offending micro-organisms or their toxic products in the root canal or apical tissues. A successful treatment depends on the complexity of the canal system and size of the periapical granuloma (more than 2 canals is difficult to be treated by conservative endodontic therapy

Non restorable teeth may be extracted, followed by curettage of all apical tissues, with nonsteroidal anti-inflammatory drugs in symptomatic cases. Antibiotic are not recommended unless systemic signs and symptoms are present

The teeth after conventional endodontic should be evaluated at 1-3-6 months and 1-2 years, to rule out possible causes of failure which includes

1-Cyst formation

2-Persistent pulpal infection

3-Extraradicular infection ((periapical actinomycosis)

4-Accumulation of endogenous debris

5-Periapical foreign material

6-Periodontal diseases

7- Sinus penetration

8-fibrous scar formation, which is most frequently seen when both the facial and lingual cortical plates have been lost, which is not an indication for future surgery.

If initial conventional therapy is unsuccessful, periapical surgery is indicated which include through curettage of all periradicular soft tissue, amputation of the apical portion of the root and scaling of the lumen of the canal, all tissues should be submitted for histopathological examination to exclude more serious conditions, like neoplastic process.

Sequelae:-

1- Periapical granuloma may continue to enlarge with continued bone resorption
2- Acute exacerbation to an acute periapical periodontitis
3- A suppuration to form an acute periapical abscess
4- Formation of a radicular cyst
5- Low grade irritation may cause osteosclerosis (bone apposition) or cementum apposition (hypercementosis).

Acute periapical periodontitis

The factors leading to the treatment of an acute periapical periodontitis include:-

1-young tooth with open tubules

2-rampant caries

3-closed acute pulpitis

4-presence of highly virulent micro-organisms

5-weakened host defense system

Histopathological findings:

Vascular dilatation, exudates of neutrophils, and oedema, in the periodontal ligament situated in the confined space between the root apex and the alveolar bone

Clinically:

Pain is intense when external pressure is applied to the tooth, as the pressure is transmitted through the fluid exudates to the sensory nerve endings. Even light load may be sufficient to induce pain, as the fluid is not compressible; the tooth feels elevated in its socket. Hot and cold stimulation does not cause pain.

The findings are often normal as there is generally insufficient time for bone resorption to occur between the time of injury to the periodontal ligament and the onset of symptoms. If radiological changes are present, they consist of slight widening of periodontal ligament and the lamina dura around the apex.

Sequela and prognosis

The inflammation may transient if it is due to acute trauma rather than infection and the condition seen resolves. If the irritant persist the inflammation becomes chronic and may be associated with resorption of the surrounding bone. Suppuration may occur associated with necrosis and bacterial infection with continued exudation of neutrophils leading to abscess formation, called acute periapical abscess.

Acute periapical abscess

The accumulation of acute inflammatory cells at the apex of a nonvital tooth is termed a periapical abscess. It is a progression of an acute pulpitis in which exudates extend into the adjacent soft and hard tissue. Because it often contains one or more strains of virulent bacterial organisms, the exudates usually

contains potent exotoxins and lytic enzymes capable of rapidly breaking down tissue barriers. Another cause is the acute exacerbation of a chronic periapical granuloma.

Clinical features

Patients have severe pain in the area of the nonvital tooth because of pressure and the effects of inflammatory chemical mediators on nerve tissue. The exudates and neutrophilic infiltrate of an abscess cause pressure on the surrounding tissue, often resulting in slight extrusion of the tooth from its socket.

Pus associated with a lesion, if not focally drained from the tooth ((e.g. by endodontic treatment)), seeks the path of least resistance and spread into contagious structures. The affected area of the jaw may be tender to palpation, and the patient may be hypersensitive to tooth percussion. The tooth is not responding to electric pulp tester, or thermal stimuli, headache, malaise, fever and chills may be present

Radiographic features:-

Abscess may demonstrate a thickening of apical periodontal ligament, an ill-defined radiolucency, or both. However, often no appreciable alterations can be detected because insufficient time has occurred for significant bone destruction.

If the condition is an exacerbation of a chronic periapical periodontitis or periapical granuloma. It could demonstrate the outline of the original chronic lesion with or without the associated bone loss.

Histopathology-Microscopically

A periapical abscess appears as a zone of liquefaction, composed of pertinacious exudates, necrotic tissue and viable and dead neutrophils, (pus).

Adjacent tissues containing dilated vessels and a neutrophilic infiltrate surrounds the area of liquifactive necrosis.

Sequelae

1-with progression, the abscess spreads along the path of least resistance and discharge into the oral cavity through a sinus tract following local penetration of overlying periosteium and mucosa. This is usually not painful. On other occasions the pus may accumulate beneath the mucosa and the patient may complain of a swelling at the intraoral openong of a sinus tract, which is a mass of subacutely inflamed granulation tissue known as parulis ((Gum boil))

2- May extend through the medullary spaces away from the apical area, resulting in osteomyelitis

3-it may perforate the cortex and spread diffusely through the overlying soft tissue as cellulitis.

4-dental abscesses may discharge through the skin and drain via a cutaneous sinus.

5-periapical infection occasionally spread the blood stream and result in systemic symptoms such as fever, lymphadenopathy and malaise.

6-it may spread diffusely through facial planes of the soft tissues. This acute and edematous spread of an acute inflammatory process is termed cellulitis.

Cellulitis is a misnomer, because the process is not an inflammation of the cells but an acute condition in which purulent forms of bacteria, involve the facial and perioral mucosa.

The most common cause is extension from a periapical abscess. However other causes may also results in cellulitis like fractures.

Occasionally the exudates tracks onto the palate, producing a large swelling, when a periapical abscess erodes into the maxillary sinus, destroying the intervening bone and lining, and the offending tooth is extracted, a communication between the floor of the maxillary sinus and the oral cavity may result. This tract may remain permanently patent, particularly if it becomes lines by epithelium of the maxillary sinus and the oral cavity. This abnormal open communication is called oroantral fistula.

Involvement of the soft tissue and muscle overlying the maxilla usually result in perioral swelling. When the muscle layers overlying the body of the mandible are involved, patients experience a puffy swelling on the side of the face.

Extension of the pus lingually into the tissue spaces of the posterior floor of the mouth may result in swelling of the structures around the epiglottis which is a life threatening, as it restricts the airway and may cause suffocation.

Cellulitis of this area ((submental , submandibular and sublingual spaces)) is called Ludwig's angina.

Another serious complication is the extension of the exudates into the maxillary cavernous sinus area, resulting in thrombophlebitis. From this location fatal forms of brain abscess or acute meningitis are possible unless rapid intervention is undertaken.

Treatment and prognosis

Treatment of periapical abscess consist of drainage and elimination of the focus of infection

Localized abscess should be drained by incision and drainage. If the abscess is localized with no systemic features ((fever, lymphadenopathy and malaise)), the patient is healthy, antibiotics are not recommended. However if the patient

is compromised (e.g. diabetic) or, systemic symptoms are present antibiotics are recommended.

NSAID is needed if not contraindicated. The tooth should be endodontically treated or extracted. Sinus and fistula tracts if not treated spontaneously after extraction, should be removed surgically

Radicular cyst

Clinical and radiographical features

Apical radicular cyst are the most common cystic lesions in the jaws and are always associated with apex of non vital teeth , they account for about 75% of all radicular cyst. When small they are frequently symptomless and are usually discovered during routine radiographical examination as they enlarge, they produce expansion of alveolar bone and ultimately may discharge through sinus. However the majority of radicular cyst does not grow to large dimension. The expansion of the alveolar bone is due to deposition of successful layers of new bone by overlying periosteium. As the cyst enlarge and cause bone resorption centrally. Increments of new sub periosteoal bone are lead down to maintain the integrity of the cortex. Producing a bony hard expansion. However the rates of expansion tens to out strip the rate of subperiosteol deposition. Leading to progressive thinning of the cortex which can be default on palpitation producing the clinical signs of oil can bottoming and egg shell is crackling. Eventually the cyst may perforate the cortex and present as a bluish fluctuant sub mucosal swelling. The rate of expansion of radicular cyst has been estimated at a proximately 5 mm diameter per year.

Pain is seldom a feature unless there is an acute exacerbation which may readily progress to abscess formation. The cyst can rise at any age after the tooth eruption but are rare in deciduous dentition. They are most common

between the ages of 20-60. They can occur in relation to ant tooth in the arch although 60% are found in the maxilla where there is a particular high incidence in anterior teeth. In addition to dental caries pulp death from trauma and irritant restorative material is more likely in anterior teeth than at other sites. Pulp death in maxillary lateral incisors may also be associated with an invaginated odontoma in the mandible the majority of cyst occur posterior to the canine tooth. Radiographically the apical radicular cyst presents as a round or avoid radiolucency at the root apex. The lesion is often well circumscribed and may be surrounded by peripheral radio-opaque margins continues with lamina dura of the involved tooth. However whether or not cyst formation has occurred in an apical radiolucency cannot be detected from radiographic appearance alone. The other varieties of radicular cyst are less common. The residual cyst is a radicular cyst that has remained in the jaw and failed to resolve following extraction of the involved tooth. About 20% of radicular cysts are of this type. However it should be noted that most periapical inflammation will resolve after removal of the causative agents. The reasons why some lesion persists as residual cyst are unknown. The lateral type is very uncommon and arises as a result of extension of inflammation from the pulp to into the lateral periodontal along the lateral root canal

Pathogenesis

Radicular cyst arises from proliferation of rest of malassez within chronic periapical granulomas but not all granulomas progress to cyst. The factors which determine why cystic transformation occurs in some and the mechanism involved in the formation of cyst are controversial. Persistence of chronic inflammatory stimuli are derived from the necrotic pulp appears essential since as mentioned above. Most periapical inflammation will resolve spontaneously once the causative agent has removed. It is assumed that the environment within chronically inflamed granuloma. Which is likely to be rich in cytokines

including growth factors? Stimulates the rate of malassez to proliferate strands and sheets of squamous epithelium derived from proliferation of the rest are common finding in the periapical granulomas. The mechanism of formation of an epithelial lined cyst cavity within granuloma is unclear. Two main mechanism have been proposed

1- Degeneration and death of central cells within a proliferating mass of epithelium. Epithelium is a vesicular and transport of metabolites and gaseous exchange occur by diffusion. It argued that when the mass proliferating epithelium within granuloma reaches a critical size. The central cells furthers away from the surrounding vascular bed. Degenerate and die, the micro cyst so formed then continues to expand
2- Degeneration and liquifactive necrosis of granulation tissue. It is suggested that areas of granulation tissue within the granuloma may undergo necrosis due to enclavement by proliferating strands of epithelium or to release toxic products from a dead pulp or from infecting organism. Epithelial proliferation to surround such an area of necrosis results in the formation of cyst.

Histopathology

Radicular cyst are lined wholly or impart by know keratinized stratified squamous epithelium supported by a chronically inflamed fibrous tissue capsule. In a newly formed cyst the epithelial lining is irregular and may vary considerably in thickness. Hyperplasia is a prominent feature in long anastomosing cords of epithelium forming complex arcades extending into the surrounding capsule. The latter is richly vascular and diffusely infiltrated by inflammatory cells often predominant. In established cyst the epithelial lining is more regular in appearance and fairly even thickness breaks in the linings epithelial discontinuities are common. Metaplasia of epithelial lining may give rise to a mucus cell. Found in about 40% of radicular cyst lining and more

rarely ciliated cells and area of respiratory type epithelium. In approximately of cases the lining contains hyaline eosinophilic bodies Rushton bodies of varying size and shape. They appear to have no clinical or diagnostic significant and they origin is unknown. But they may represent some type of epithelial product. Within time the connective tissue capsule tends to become more fibrous and less vascular and there is reduction in the density of inflammatory cell infiltration, myofibroblast in capsule may help to constrain the tendency of the cyst to expand.

Deposits of cholesterol crystals are common within the capsules of many radicular cysts. In histological sections cholesterol clefts may be few in number of forms large mural nodules in which case they are often associated with epithelial discontinuity and project into cyst lumen. They are the probable of cholesterol crystals found in the cyst fluid; mural cholesterol clefts are associated with foreign body giant cells. As a periapical granulomas the cholesterol probably derived from the breakdown of red blood cells as a result of hemorrhage in the cyst capsule and deposits of hemosiderin are commonly associated with the clefts

Cyst contents

The cyst contents vary from a watery straw color fluid through to semi solid brownish material of paste like consistency. Cholesterol crystals impart a shimmering appearance the composition of cyst fluid is a complex of variable it is hypertonic compared with serum and contents

1-breakdown products of degenerating epithelial cell and inflammatory cell and connective tissue components

2-serum proteins all groups of serum proteins are present in cyst fluid and the soluble proteins level is 5-11 g/dl most are derived as inflammatory exudates.

Compared with serum the fluid contain higher level of immunoglobulin which probably reflect local production of plasma cells in the capsule

3- Water and electrolytes
4- Cholesterol crystals

Cyst expansion

- Cysts expansion is dependent on osteoclastic resorption of surrounding bone. Osteoclasts are derived from haematopoietic precursors and are transported via the blood.
- Osteoclasts are recruited to and activated at sites of resorption by mediators. The cytokines interleukin-1 and interleukin-6 (IL-1, IL-6) tumor necrosis factor and prostaglandin E2 are key mediators in cyst expansion.
- Mediators are generated locally by a variety of cells e.g.: macrophage, lymphocytes, epithelial cells, fibroblast.
- Activated osteoclast attached to the bone surface and release acids resulted in de mineralization. The organic matrix is then degraded by matrix metalloproteinase MMP's, collagenases, and lysosomal proteases.
- MMP's synthesized by other cells in the cyst wall e.g.: fibroblasts, epithelial and inflammatory cells, may contribute to matrix degradation.
- Bone resorption is followed by cyst expansion which may involve hydrostatic pressure.
- Cyst contents are hypertonic. The wall acts as a semi permeable membrane and retains the osmotically active molecules in the lumen creating an osmotic gradient. Water moves into the lumen along the gradient increasing the hydrostatic pressure in the cyst leading to enlargement.

- Enlargement is a complained by growth of the lining and the capsule. IL-1 and IL-6 stimulate epithelial proliferation other epithelial and fibroblast growth factors are also synthesized.

Treatment of radicular cyst:

The treatment of periapical radicular cyst depend on the condition of the tooth as whole, if the tooth is restorable, the root canals can be filled, if the root canals cannot be filled and the apical area is in a location accessible for surgery, an apicoectomy with complete surgical enuculation may be performed to remove the cystic lesion, followed by histopathological examination; otherwise, the tooth is extracted and the periapical cyst is curreted through the tooth socket.

Oral pathology

Dental caries

Dental caries is a multifaceted disease involving interplay among the teeth, the oral host factors of saliva and microflora, and the external factor of diet. The disease is a unique form of infection in which specific strains of bacteria accumulate on the enamel surface, where they elaborate acidic and proteolytic products that demineralize the surface and digest its organic matrix.

Once penetration of the enamel has occurred, the disease progress through the dentin to the pulp. If the process is not stopped, the tooth becomes destroyed.

Epidemiology of dental caries

The prevalence and severity of dental caries differs among various populations throughout the world. The caries activity in a particular society or geographic area is closely correlated with the amount of sugar consumed per capita. In the more industrialized countries, where diets have traditionally had a high content of refined carbohydrates, the caries rate has been considerably higher than in less-developed countries. In recent years with the trend toward preventive measures such as fluoridated water, greater access to dental care and better oral hygiene in industrialized countries, and the concurrent rapid increase in caries activity in the less-developed societies, the large difference in caries rate has decreased.

Factors affecting caries prevalence: -

1- race: people living in same geographical area but belonging to different race have differing caries incidence. Generally, chinese, blacks, indians have lesser caries incidence than the caucasian whites.

2. Age: dental caries more prevalent in children up to 12 years. Incidence decreases somewhat in younger and middle age group. Incidence increases again by the older age.

3. Gender: incidence of caries is significantly higher in females than males. This may be due to the fact that teeth in females erupt earlier compared to males.

4. Familial: there appears to be heredity involved. Children of parents with low caries experience also show lesser caries incidence and vice versa.

Loss of tooth substance may result from the action of oral microorganism in dental caries (bacterial causes), or may be due to non- bacterial causes, which include:

A- Mechanical factors associated with attrition and abrasion.
B- Chemical erosion.
C- Pathologicresorption.

Primary causes of dental caries

Dental plaque,dietary carbohydrates, tooth (susceptible tooth surface) and time.

The carious process : bacteria in dental plaque fermentable carbohydrates such as sugars (sucrose & glucose). .production of acids causing the plaque ph to fall below 5 .Repeated fall in ph in time may result in the demineralization of susceptible site on the tooth surface initiating the carious process.

Dental caries follows the interaction of four main factors, the host, bacteria, food (diet) and time for the process to develop.

Food + bacteria ⟶ acid +tooth ⟶ D.C.

Caries is one of the most common of all diseases and still a major cause of loss of teeth.

Dental caries is the most prevalent chronic disease in man throughout the world, 95% of the population have decay or will have it before they die. The only way to control

the disease is through the use of systemic and topical fluoride, furthermore dental \-\\\\ crycaries can be controlled by controlling the four main factors that are related to it: -

1- Host (tooth): administration of fluoride (as tables, or fluoride-containing diet), and fissure sealant (seal deep fissures in tooth surface to prevent accumulation of plaque).

2- Microorganism (bacterial flora): their action is hindered by active and passive immunization, and reduces the intake of sugars.

3- Diet (food):- reduction in consumption of cariogenic sugar like sucrose, fructose, maltose, glucose, both intrinsic sugar (from fruits and vegetables) and extrinsic sugars (added sugars, milk, fruit juices).sucrose is considered as the most cariogenic type of sugar because (1) it is readily fermented by bacterial plaque, and (2) its easily converted to extracellular glucans by bacterial glucosyltransferase. Glucans act as glue for bacteria helping their adherence to tooth surface.

4- time: frequent sugar intake between primary meals, as well as stopping teeth brushing for 12-14 hours will permit formation of bacterial plaque.

There are other indirect factors that have a role in the development of dental caries, such as:-

Tooth: regarding its

- Composition; (less fluoride, iron, zinc, magnesium make tooth more susceptible to dental caries).
- Morphology; (deep pits and fissures can seat more bacterial plaque).
- Position; (malposed tooth can hold more bacterial plaque).

Saliva: regarding its:

- Composition; inorganic constituents are more beneficial than organic constituents.

- ph; the higher the ph the less the action of bacteria.
- Quantity; the more the best washing action of plaque out of embrasures, fissures and pits.
- Viscosity; the more watery the best for the removal of plaque.
- Other antibacterial factors that prevent the proliferation of bacterial flora.

Diet (food): regarding its: Physical factors: quantity of diet.

Local factors: carbohydrate content, fluoride content, vitamin content.

Soft sticky food enhances the formation of plaque, and consequently caries. Refined carbohydrates, especially sucrose, are more likely to cause caries than raw products.

Vitamin content of diet: -

Of all vitamins, only vit d and vit k appear to have some role in the caries process. Vit d may have an indirect effect on caries process. Its deficiency can cause enamel hypoplasia which can make the tooth more susceptible to caries. Vit k has enzyme inhibiting action in carbohydrate degradation cycle can be utilized as an anticariogenic agent.

Calcium &phoshorus content:-

Available evidence indicates that there is no relation between dietary calcium and phosphorus and dental caries.

Fluorine content: - while topical and water fluoridation has been known to be effective in caries control, dietary fluorine may have no role as it is unavailable metabolically.

Systemic factors

Heredity: - racial tendency for high or low caries may be explained by heredity. However, local factors like change in dietary habits can change this tendency. Possible that caries tendency may be inherited through tooth form & structure

Pregnancy & lactation: - commonly observed that during pregnancy, women tend to neglect their oral health owing to all her attention being diverted to that of care for the newborn. Thus increased caries incidence during pregnancy & lactation is more a problem of neglect.

Etiology and pathogenesis:

Etiology is still controversial and not clear, due to its being complicated by many direct and indirect factors. Many theories were postulated in order to explain dental caries. Most noticed theories are:

1) ***Acidogeneic theory (miller s chemoparasitic theory 1890):-*** it is the most accepted and supported theory, because it is based on experimental studies; made later by Orland and his workers in 1954, showed that in germ free oral hygiene in some laboratory animals ,even with administration of sugar; there is no dental caries in these animals. Thus, dental caries is produced by chemical action of acids produced by micro flora.

Miller s theory suggests that dental caries develop in two phases. In the first phase, microflora attack the inorganic structure, where decalcification of enamel and dentin is carried out by means of acids produced as a result of fermented sugar accumulating in retaining spots on tooth surface .in the second phase, dissolution of the soft organic part is carried out.

Miller isolated numerous microorganisms from the oral cavity; most important species are lactobacillus acidophilus, streptococcus mutans , streptococcus sanguis , and streptococcus salivarius.

In his hypothesis, miller assigned essential roles to 3 factors:

1. Carbohydrate substrate.

2. Acid which caused dissolution of tooth minerals.

3. Oral microorganisms which produce acid and also cause proteolysis.

The mouth:

The mouth is the beginning of the digestive system chewing (masticating) not only grinds foods but degrades it with enzymes in the saliva. Saliva is a complex mixture of salts, carbohydrates, and enzymes. Some of these enzymes (amylases) break down carbohydrates into sugars that are important for the initiation of dental caries. There are many bacteria in the mouth there are really only a few species of bacteria, each bacterial species has a unique habitat in the mouth mainly streptococci are found in the mouth. *Streptococcus salivarius*, *streptococcus sanguis*, *streptococcus mitis*, streptococcus *mutans*.

The streptococci are gram positive (and have a sticky cell wall) and facultative anaerobes. Facultative organisms can live in both aerobic and anaerobic environments. Lactobacilli and actinomyces are also important oral micro flora.

Objections to the hypothesis: - unable to explain predilection of specific sites on tooth to caries. Initiation of smooth surface caries not explained. Unable to explain why some populations are caries free and some are caries prone. However, this theory is accepted by majority in unchanged form. Also, bulk of evidence does implicate carbohydrates, acids and microorganisms.

Role of dental plaque: - plaque defined as a soft, unmineralized, bacterial deposit or biofilm which forms on teeth and dental prostheses that are not adequately cleaned. Resists cleansing by physiological oral forces like salivary washing and tongue movements but is removable by tooth brushing. Considered as a contributing factor for at least initiation of caries. However mere presence of dental plaque doesn't necessarily mean caries will occur.

Composition of dental plaque => water – 80% solids – 20% dry weight of plaque composed of bacterial & salivary proteins – 50% carbohydrates & lipids - 25% inorganic ions, mainly Ca++ &PO4--- - 10%.

Classification of dental plaque => plaque classified as – supragingival&subgingival.Supragingival plaque – essential role in causing caries, while subgingival plaque – role in periodontal diseases.

Mechanism of formation =>

1- Plaque formation proceeds through following stages deposition of a cell free layer, acquired pellicle which is derived from salivary glycoproteins. This layer acts as nutrient for plaque bacteria.

2. Colonization of pellicle by gram positive bacteria like s.sanguis and s.mutans within 24 hours.

3. Maturation of plaque by further colonization with filamentous and other bacteria. Also there is buildup of plaque substance by polysaccharides produced by plaque bacteria.

2) proteolytic theory (bodecker 1878) :-

Main suggestion of this theory is that microorganism attack the organic part of enamel, leaving the generated acid responsible for further decalcification of inorganic part. Bodecker suggested that bacteria could penetrate into enamel through lamellae and interprismatic substance.

Objections to the theory: - out of 0.56% of organic matrix, 0.18% is keratin. However, no enzyme systems capable of attacking keratins have been isolated so far. Studies in germ free rats have shown that caries can occur in the absence of proteolytic

organisms. However, even though proteolysis may not play any role in initiation of caries, their role in progression of more advanced carious lesions cannot be ruled out.

3-proteolysis – chelation theory:-

Schatz et al in 1955 proposed that caries occurred as a result of simultaneous degradation of organic substances (proteolysis) and dissolution of tooth minerals by a process called chelation. According to this theory, the initial attack on the tooth is on the organic components of enamel. Breakdown products of the proteolysis have chelating properties which form chelates with mineralized components of enamel and thereby decalcify the enamel even in neutral or even alkaline ph.

Objections to this theory: - direct evidence for proteolysis – chelation as a mechanism for causing caries is lacking. Recent studies have shown that saliva as well as plaque does not contain substances in sufficient concentrations to chelate calcium from enamel. However, although chelation may not be actually responsible for initiating caries, it may still have some role to play in advanced carious lesion where the ph levels return to neutral.

The last two theories are disregarded, simply because they lack support by experimental studies.

In general, the essential requirements for development of dental carries are :

1-cariogenic bacteria.

2-bacterial plaque.

3-stagnation area.

4-fermentable bacterial substrate (sugar).

5-susceptible tooth surface.

6-time for process to develop.

Clinical classification of dental caries:-

It is classified either according to site of attack, or according to rate of attack and according to whether lesion is new or under previous restoration: -

1. Primary (virgin) caries 2. Secondary (recurrent) caries

According to site of attack, it is classified as follows:

1. Pit and fissure caries.
2. Smooth surface caries.
3. Cemental or root caries.

Pit and fissure caries: this is frequent in occlusal surfaces of molars and premolers, buccal surface of molars, lingual and palatal pits of incisors.

Early caries appears as brown or black discoloration in fissures and pits, and when inspected with dental probe, probe stick to it. In some caries in occlusal surface, where caries extends laterally in to dentin, enamel above it appears chalky white in color, because of undermined caries .caries of enamel is usually studied by ground section using a special technique, whereas in decalcified section enamel will be completely lost.

Smooth surface caries: this caries is frequent on proximal surface and gingival third of buccal and lingual surfaces (class v).

Proximal caries occur just below contact point and appear as a well-demarcated chalky white opacity of enamel.

According to rate of attack, dental caries is classified in to:

1. Rampant or acute caries.
2. Slow progressive or chronic caries.
3. Arrested caries.

1- Acute dental caries it is that form of caries that follows a rapid clinical course and results in early pulpal involvement by carious process. Predominantly affects children and young adults probably because their dentinal tubules are larger and show no sclerosis. The point of entry of caries is small even though there is rapid spread of caries at dej, producing large internal cavitation.

The small point of opening doesn't allow the buffering ions of saliva to neutralize acids formed within the cavity. The affected dentin is usually stained light yellow compared to deep brown / black of chronic caries. Pain is more likely to be seen in acute dental caries than chronic caries.

Rampant dental caries characterized by sudden, rapid destruction of teeth affecting even relatively caries free surfaces like proximal and cervical surfaces of mandibular teeth. 10 or more carious lesions over a one year period are characteristic of rampant caries. Prominently observed in deciduous dentition of young children and permanent dentition of teenagers. Dietary factors like high carbohydrate intake as well as physiological factors affecting saliva are major contributors to etiology of rampant caries.

Nursing bottle caries also called baby bottle syndrome and bottle mouth syndrome. It is a type of rampant caries and occurs due to – nursing bottle containing milk, milk formula or sweetened water. Usually, the above aids are used at sleeping time after one year of age.

Clinically seen as widespread caries of the 4 maxillary incisors followed by 1st molars and then canines. Absence of caries in mandibular teeth distinguishes it from ordinary rampant caries. If milk or other carbohydrates are rapidly cleared from mouth, they aren't cariogenic, but if they pool in the mouth, then they can cause rampant caries.

2- Chronic caries: ordinary caries that develops slowly, and appears fully damaging in old ages, because it requires time.

3- Arrested caries: is type of caries where a reminalization of dentin occurred, thus hindering further caries. .

Reminalization is achieved by fluoride in saliva, and if the caries is in a self – cleansing area. This happen in case of badly carious teeth, where enamel is grossly damaged and fractured, thus dentin is reminalized. Also in proximal surfaces caries, after one of the teeth is extracted, the spot of caries will be in self – cleansing area and get reminalized by fluoride in saliva.

4- Recurrent caries.

Histopathology of caries:

Histopathology of caries of enamel

Enamel forms the main protective covering of the grown. Enamel is composed of 96% inorganic material, and 4%organic material and water. Enamel structure is constructed by enamel rods or prisms, rod sheath and interprismatic substance. Enamel rods appear as a body and tail directed from dentinoenamel junction; dej, outward to root surface.

Enamel consists of crystals of hydroxyapatite packed tightly together in orderly arrangement. Each crystal is separated from its neighbors by tiny intercrystalline spaces or .pores. The spaces are filled with water and organic material. When enamel is exposed to acids produced by dental plaque, minerals is removed from the surface of the crystals which shrinks in size. The intercrystalline spaces enlarge and the tissue becomes more porous. “At this stage the carious lesion can be detected clinically and called white spot lesion “.

White spot lesion

The earliest microscopic evidence of caries in enamel best seen on dried tooth as a small, opaque, white area.Sometime the lesion may appear brown in color due to exogenous materials .absorbed into its porosities. If the early enamel lesion progress, the intact surface breaks down (cavity formation).

The carious lesions in smooth surface are slightly different when compared to that in pits and fissure caries.

Microscopic appearance of the white spot lesion on a smooth surface:

Smooth surface = proximal surfaces and buccal surfaces of the teeth. Usually cone shaped: the apex of the cone pointing toward the dentino enamel junction (dej). The lesion takes this shape because it follows the direction of the enamel prisms.

Several zones can be distinguished before complete destruction of the enamel

Zone i: translucent zone: In this zone, demineralization has taken place (magnesium and carbonates are dissolved) not seen in all lesions lies at the advancing front of the lesion More porous than sound enamel. Pores have been created by the demineralization process.

Zone ii: dark Zone: Someremineralization happens due to reprecipetation of minerals, lost from the translucent zone just superficial to the translucent zone. More porous than the translucent zone.

Zone iii: body of the lesion: It is the area of greatest demineralization and having a higher fluoride level and lower magnesium level. The largest portion of the lesion superficial to the dark zone. Increase in porosity from the peripheries to the center.

Zone iv: the surface zone unaffected surface layer that cover the small lesion. High degree of mineralization than subsurface enamel.

If the lesion progress the surface layer will be destroyed.Leads to cavity formation.

Histopathogenesis of the early lesion

The development of enamel caries can be traced through the following stages when ground sections are examined by transmitted light

1-development of a surface translucent zone, which is unrecognizable clinically and radiographically.

2-the subsurface translucent zone enlarges and a dark zone develops in its center.

3-as the lesion enlarges more mineral is lost and the center of the dark zone becomes the body of the lesion. This is relatively translucent compared with sound enamel and show enhancement of the striae of retzius. Interprismaticmarkings and cross striation of the prisms. The lesion is now clinically recognizable as a white spot.

4-the body of the lesion may become stained by exogenous pigments from food, tobacco, and bacteria. The lesion is now clinically recognizable as a brown spot

5-when the caries reaches the amelodentinal junction it spreads laterally, and in this way the enamel may become widely undermined, giving the bluish-white appearance of the enamel seen clinically, extension along the amelodentinal junction may result in secondary undermining enamel caries. The time for caries to progress through enamel on the approximal surfaces of permanent teeth has been reported to be about 4 years but may be up to 8 years.

6-break down of the surface zone with formation of a cavity. This stage may precede stage 5.

In some lesions dentin may be involved late in stage 3. While in other lesions it is not involved until stage 5 or 6. Bitewing radiograph do not show lesions until stage 4 or possibly late stage 3

No unequivocal evidence for specific points of entry of the carious attack into the enamel has been found with light microscopy. Acid appear to diffuse in over a broad front. Ultrastructural studies suggest preferential dissolution initially along prism

boundaries, but there is also a diffuse demineralization with an increase in intercrystallite distance affecting areas both within and between the prisms. These intercrystallite spaces presumably reflect the variation in pore volume in different areas of the lesion; changes in crystal structure are thought to be due to both demineralization and reprecipitation of mineral.

Pit and fissure caries (occlusal caries):-

The caries follow the direction of the enamel rod, and a triangular or cone shaped lesions with the apex at the outer surface, and its base toward the dentino-enamel junction.

Light microscope appearance of occlusal caries:-

The lesion forms around the fissure walls. As the lesion increases in size, it coalesces at the fissures. The enamel lesion enlarges as it approaches the underlying dentin guided by prism direction. The lesion takes the shape of a cone with its base toward the enamel-dentin .junction. The tooth enamel (outer layer of crown) is very hard and doesn't dissolve easily even with acids, but the underlying dentin dissolves easily with lactic acid eventually a cavity is formed in the dentin below the enamel , when the cavity is large enough, the enamel will crack, exposing the dentin, bacteria find the dentin a rich environment for growth and quickly eat through the dentin into the underlying pulp(where the blood vessels and nerves are) this is now a rampant carries and the tooth will likely be removed.

Fluoride makes the tooth mineral harder to dissolve, this is why fluoride treatment is effective in preventing dental caries.

Note: - more cavitations in pits and fissure than smooth surface caries. Why? Because:-

1- The enamel at the bottom of the pit and fissure may be very thin, so caries reach faster.

2- In pits and fissure, the enamel rods are directly directed laterally (diverge), when caries occur it follows the direction of these rods leading to the formation of cone shaped or triangle.

3- The enamel at the surface become undermined and starts to collapse under the stress of mastication and to fragment around the edge of the cavity. By this stage, bacterial attack on the dentin is well established. Cavitations are greater than that of the proximal surface.

Caries of dentin

Dentin composed of 30% organic material and water, 70% inorganic material.

Dentin is composed of dentinal tubules, inside which is the odontoblastic process. Odontoblastic process is the extension of odontoblas inside the dentin, these process have lateral branches anatomizing with each other, and form a network.

As caries reaches the enamel-dentin junction, caries spread laterally along the junction. Sound enamel appears to be undermined by the carious process in dentin. Undermined enamel is brittle and can be fractured producing a large cavity.

When caries reached the dentin, there is a lateral spread of the lesion, involve more tubule which act as pathway or tract along which the microorganism will spread to the deeper areas and then to the pulp in a conical or triangular pattern with the apex toward the pulp and the base to the dentine.

At the first, the decalcified dentin retains its normal morphology and no bacteria can be seen.

Once the dentine has been reached, pioneer bacteria extend down the tubule, soon fill them and spread along any lateral branches.

The tubules become distended into spindle shapes by the expanding masses of bacteria and their product, as a result, adjacent tubule which are less heavily infected become bent, later the intervening tubule wall are destroyed and collections of bacteria in adjacent tubule coalesce (united) to form irregular liquefaction foci (these are ovoid areas of dentinal destruction and it is parallel to the direction of dentinal tubule. It is filled with necrotic debris which increases gradually in size by expansion; in some areas, bacteria also spread laterally and occasionally large bacteria filled, clefts formed at right angles to the tubules. Clinically, these clefts may allow carious dentin to be excavated easily.

We can summaries dentin carious lesion from the pulpal aspect outward into following zones:-

1- Zone of fatty degeneration of protoplasmic process: effect of bacterial enzyme on the cell membrane of the organic component.

2- Zone of dentinal sclerosis (translucent zone): regarded as vital reaction of odontoblast to irritation (deposition of calcifying salts from the demineralized zone).

3- Zone of decalcification: soft dentin due to the action of bacterial enzyme

4- Zone of bacterial invasion.

5- Zone of decomposition of dentin: cavitation (become no mineralized remain and the organic component dissolved by the bacteria).

Protection reaction of dentin and pulp under caries:

The reaction in dentin are mainly due to odontoblast activity, these reactions are not specific to dental caries, but may be occur as a result of other irritant cause such as attrition, abrasion and restorative procedure.

At early stage of dentin caries, a defensive mechanism of dentinal tubule and the vital pulp occur by:

1- Development of dentinal sclerosis or translucent dentin which mean calcification of dentinal tubules which will seal them to prevent bacterial penetration, this form in a band about half way between the pulp and adj. This process is minimal in rapidly advancing caries and prominent in slow dentin caries.

2- the odontoblast in the pulp react to changes in dentin by formation of reparative dentin (tertiary dentin – a tubular dentin) this dentin is localized to the irritant odontoblast irregular or a tubular dentin.

3- Secondary dentin: tubular dentin separated from primary dentin by hyperchromatic line or demarcated zone. It is formed following eruption throughout the life of the tooth.

Root surface caries:

Cementalcaries:

Cementum, hard tissue covering dentin in root region. It is composed of 45-50% inorganic material, and50-55% organic material. Cementum is of two types:

A- Cellular cementum , covering root from cej to apical one third of the root. Cells are termed cementocytes and are spider shaped cells.

B- AcellularOccur chiefly in old people in whom the gingiva has retracted.

At first, plaque forms in the cemental surfaces, then the microorganism penetrate the cementum along or across calcified sharpies fibers. Then the bacteria seem to spread vertically in layers following the pattern of cementum formation

The cementums soften beneath the plaque over a wide area producing a saucer-shaped cavity. The decalcification of the cementum is formed by further destruction as in dentin.

Arrest of lesions

Inactive or arrested white spot lesions have a shiny surface and may be brown in color, having picked up exogenous stains from the mouth. These lesions cannot be detected by gently drawing a sharp probe across them because they feel the same as normal enamel. Histologically these lesions show wide, well-developed dark zones at the front of the lesion within the body of the lesion and at the surface of the *lesion*.

It is very important to realize that the carious process can be arrested by simple clinical measures such as improved plaque control with fluoride toothpaste and altered diet. It is therefore the clinician's responsibility to detect enamel caries in its earliest form by careful visual inspection of teeth after cleaning and drying. The clinician can now help the patient tip the balance in favor of arrest rather than progression of lesions. An arrested white spot is more resistant to acid attack than sound enamel. It may be regarded as scar tissue and should not be attacked with a dental drill.

Arrested caries and remineralizationprecavity (white spot) may become arrested when the adjacent tooth is removed so that the stagnation area is removed, the lesion may become remineralized by mineral from the saliva.

Dentin caries may occasionally be arrested as a result of destruction of so much enamel, that a wide area of dentin become exposed, if this surface is then subject to attrition , plaque deposition may be prevented by use of fluoride and consumption of a less cariogenic diet may cause a surface lesion in enamel to heal entirely.

Immunological aspects of dental caries

Caries in man is associated with the development of serum and salivary antibodies against s. Mutans, but in all most all individuals this natural active immunity appears to have little effect as caries is virtually universal in western populations. This may be because s. Mutans in only weakly antigenic

However, artificial active immunity following experimental immunization of rats and monkeys with s. Mutans using both live and dead organisms as well as cell wall preparation has been shown to produce a significant reduction in caries. Immunization evokes a humoral response characterized by Igg, Igm, and Iga classes of antibodies and also induces cell-mediated immune responses, these effectors system can gain access to the oral cavity via the gingival crevice and saliva, but the immunological mechanisms involved in prevention of dental caries are unclear, however, in these experimental systems the reduction in the number of carious lesions appears to be associated with the reduction in the number of s. Mutans organisms in plaque.

The salivary immune mechanism would presumably act through secretary Iga and might prevent s. Mutans from adhering to the tooth surface crevicular immune mechanism could involve any or all of humeral and cellular components of systemic immunity.

Immunoglobulin complement: Neutrophil leukocytes sensitize lymphocytes and macrophages may pass through the base of sulcus and so reach tooth surface. Although the relative importance of salivary and crevicular mechanism has not been fully elucidated, the powerful immune component of the later suggest it is the more important.

Evidence suggest that protection is associated with Igg mediated reaction and that Iga, andIgm antibodies confer little or no protection and may interfere with the protective effect of Igg. The Igg antibody may act as opsonin facilitating phagocytosis and ultimately death of s.mutans by neutrophils and macrophages. The role of cell mediated immune response is uncertain but helper T cell function is important. Vaccines composed of whole cell of s.mutans may induce an antibodies that cross react with hard tissue, and so sub component of organsim, have been investigated which return the capacity against caries but which do not contain cross reacting heart antigens. These include proteins purified from the cell wall of s. Mutans that are

involved in the attachment of the organism to the tooth surface. Several over antigens preparation have been tested in animal studies including glucosyltransferase, these bacterial enzymes convert sucrose into glucans which are important for accumulation of s. Mutans on tooth surface. Although antibodies to glycosyltransferase can reduce the accumulation of the plaque and the incident of caries to rodents, they appear to have a little protective value in primates; this may be because such antibodies are probably most effective against the development of smooth surface rather than pits and fissure caries.

Oral pathology
Giant cell lesions

Dr. Layla

Giant cell lesions of the jaw include:-
1-Giant cell granuloma (central-peripheral)
2-Giant cell tumor (osteoclastoma)
3-Aneurysmal bone cyst
4-Cherubism
5-Brown tumor of hyperparathyroidism

Peripheral giant cell granuloma (giant cell epulis):
The peripheral giant cell granuloma is a relatively common tumor like growth of the oral cavity. It probably does not represent a true neoplasm but rather is a reactive lesion caused by local irritation or trauma.

In the past it often was called a peripheral giant cell reparative granuloma, but any reparative nature appears doubtful. Some investigators believe that the giant cells show features of osteoclasts, whereas other authors have suggested that the lesion is formed by cells from the mononuclear phagocyte system.

The peripheral giant cell granuloma bears a close microscopic resemblance to the central giant cell granuloma, and some pathologists believe that it may represent a soft tissue counterpart of this central bony lesion.

Clinical and Radiographic Features:
The peripheral giant cell granuloma occurs exclusively on the gingiva or edentulous alveolar ridge, presenting as a red or reddish-blue nodular mass. Most lesions are smaller than 2cm in diameter although larger ones are seen occasionally. The lesion can be sessile or pedunculated and may or may not be ulcerated.

The clinical appearance is similar to the more common pyogenic granuloma of the gingiva. Peripheral giant cell granulomas can develop at almost any age but show peak prevalence in the fifth and sixth decades of life. Approximately 60% of cases occur in females.

Although the peripheral giant cell granuloma develops within soft tissue. "cupping" resorption of the underlying alveolar bone sometimes is seen. On occasion, it may be difficult to determine whether the mass arise as a peripheral lesion or as a central giant cell granuloma that eroded through the cortical plate into the gingival soft tissues.

Histopathologic Features:
Microscopic examination of a peripheral giant cell granuloma" showsproliferation of multinucleated giant cells within a back ground of plump ovoid and spindle-shaped mesenchymal cells.The giant cells may contain only a few nuclei or up to several dozen. Some of these cells may have large vesicular nuclei, others demonstrate small pyknotic nuclei.
Abundant hemorrhage is characteristically found throughout the mass which often results in deposits of hemosiderin pigment especially at the periphery of the lesion.
The overlying mucosal surface is ulcerated in about 50% of cases.
A zone of dense fibrous connective tissue usually separates the giant cell proliferation from the mucosal surface.Adjacent acute and chronic inflammatory cells are frequently present. Areas of reactive bone formation or dystrophic calcifications are not unusual.

Treatment and Prognosis
The treatment of the peripheral giant cell granuloma consists of local surgical excision down to the underlying bone. The adjacent teeth should be carefully scaled to remove any source of irritation and to minimize the risk of recurrence. Approximately 10% of lesions are reported to recur and reexcision must be performed

Central giant cell granuloma (giant cell lesion; giant cell tumor)(CGCG)
The giant cell granuloma is considered widely to be a non-neoplastic lesion,although formerly designated as "giant cell reparative granuloma," there is little evidence that the lesion represents a reparative response.
Some lesions demonstrate aggressive behavior similar to that of a neoplasm. Most oral and maxillofacial pathologists have dropped the term "reparative"; today, these lesions are designated as giant cell granuloma giant cell lesion. Whether or not true giant cell tumors occur in the jaws is uncertain and controversial.

Clinical and Radiographic Features
Giant cell granulomas may be encountered in patients ranging from 2 to 80 years of age, although more than 60% of all cases occur before age 30. A majority of giant cell granulomas are noted in females, and approximately 70% arise in the mandible. Lesions are more common in the anterior portions of the jaws, and mandibular lesions frequently cross the midline.
Most giant cell granulomas of the jaws are asymptomatic and first come to attention during a routine radiographic examination or as a result of painless expansion of the affected bone. A minority of cases, however, may be associated with pain, parasthesia, or perforation of the cortical bone plate, occasionally resulting in ulceration of the mucosal surface by the underlying lesion.

Based on the clinical and radiographic features, several groups of investigators have suggested that central giant cell lesions of the jaws may be divided into two Categories:

1. Nonaggressive lesions make up most cases, exhibit few or no symptoms, demonstrate slow growth, and do not show cortical perforation or root resorption of teeth involved in the lesion.

2. Aggressive lesions are characterized by pain, rapid growth, cortical perforation and root resorption. They show a marked tendency to recur after treatment, compared with the nonaggressive types.

Radiographically:

Central giant cell granulomas appear as radiolucent defects, which may be unilocular or multilocular. The defect is usually well delineated, but the margins are generally non corticated. The lesion may vary from a 5 X 5 mm incidental radiographic finding to a destructive lesion greater than 10 cm in size. The radiographic findings are not specifically diagnostic. Small unilocular lesions may be confused with periapical granulomas or cysts. Multilocular giant cell lesions cannot be distinguished radiographically from ameloblastoma or other multilocular lesions.

Histopathologic Features

Giant cell lesions of the jaw show a variety of features. Common to all is the presence of few-many multinucleated giant cells in a background of ovoid to spindle shaped mesenchymal cells. There is evidence that these giant cells represent osteoclasts, although others suggest the cells may be aligned more closely with macrophages.

The giant cells may be aggregated focally in the lesional tissue or may be present diffusely throughout the lesion. These cells vary considerably in size and shape from case to case. Some are small and irregular in shape and contain only a few nuclei. In other cases, the giant cells are large and round and contain 20 or more nuclei.

Areas of erythrocyte extravasation and hemosiderin deposition often are prominent. Older lesions may show considerable fibrosis of the stroma. Foci of osteoid and newly formed bone are occasionally present within the lesion.

Treatment and Prognosis

Central giant cell lesions of the jaws are usually treated by thorough curettage. In reports of large series of cases, recurrence rates range from 2% to 50% or greater. Most studies indicate a recurrence rate of about 15% to 20%.Those lesions considered on clinical and radiologic grounds to be potentially aggressive show a higher frequency of recurrence. Recurrent lesions often respond to further curettage, although some aggressive lesions require more radical surgery for cure.In patients with aggressive tumors, three alternativessurgery-(1) corticosteroid's (2) calcitonin, and (3) interferon alfa-2a-. In spite of the reported recurrence rate, the long term prognosis of giant cell granulomas is good and metastases do not develop.

Giant cell tumor:(osteoclastoma)

The question of whether true giant cell tumors, which most often occur in the epiphyses of long tubular bones, occur in the jaws has been argued for many years and still is unresolved. Although most central giant cell lesions can be distinguished histopathologically from the long bone tumors ,a number of jaw lesions are indistinguishable microscopically from the typical giant cell tumor of long bone.

In spite of the histopathologic similarity, these jaw lesions appear to have a biologically different behavior from long bone lesions, which have **higher recurrence rates** after curettage and show **malignant change in up to 10% of cases.**

Cherubism(hereditary bone disease)

Cherubism is a rare developmental jaw condition that is generally inherited as an autosomal dominant trait. The name cherubism was applied to this condition because the facial appearance is similar to that of the plump-cheeked little angels (cherubs) depicted in Renaissance paintings.

Clinical and Radiographic Features

The disease usually occurs between the ages of 2 and 5 years. In mild cases, the diagnosis may not be made until the patient reaches 10 to 12 years of age. The clinical alterations typically progress until puberty, then stabilize and slowly regress.

The cherub like faces arises from bilateral involvement of the posterior mandible that produces angelic chubby checks. The mandibular lesions typically appear as a pain less, bilateral expansion of the posterior mandible that tends to involve the angles and ascending rami. Milder maxillary involvement occurs in the tuberosity areas; in severe cases, the entire maxilla can be affected.

In addition, there is an "**eyes upturned to heaven"** appearance that is due to a wide rim of exposed sclerae noted below the iris.

Radiographically:

The lesions are typically multilocular expansile radiolucencies. The appearance is virtually diagnostic as a result of their bilateral location. No unusual biochemical findings have been reported in patients with cherubism.

Histopathologic Features

The microscopic findings of cherubism are essentially similar to those of isolated giant cell granulomas, and they seldom permit a specific diagnosis of cherubism in the absence of clinical and radiologic information.

The lesional tissue consists of vascular fibrous tissue containing variable numbers of multinucleated giant cells.Foci of extravasated blood are commonly present. In some cases, cherubism reveals **eosinophilic, cuff like deposits** surrounding small blood vessels throughout the lesion. The eosinophilic cuffing appears to be specific for cherubism. However, these deposits are not present in many cases, and their absence

does not exclude a diagnosis of cherubism. older, resolving lesions of cherubism, the tissue becomes more fibrous, the number of giant cells decreases, and new bone formation is seen.

Treatment and Prognosis

The prognosis in any given case is unpredictable. In most instances, the lesions tend to show varying degrees of remission and involution after puberty. By the fourth decade, the facial features of most patients approach normalcy. In spite of the typical scenario, some patients demonstrate very mild alterations, whereas others reveal grotesque changes that often are very slow to resolve. In occasional patients, the deformity can persist.

The question of whether to treat or simply observe a patient with cherubism is difficult. Excellent results have been obtained in some cases by early surgical intervention with curettage of the lesions. Conversely, early surgical intervention sometimes has been followed by rapid regrowth of the lesions and worsening deformity. The optimal therapy for cherubism has not been determined.

Aneurysmal bone cyst

Aneurysmal bone cyst is an intraosseous accumulation of variable-sized blood filled spaces surrounded by cellular fibrous connective tissue that often is admixed with trabeculae of reactive woven bone.

The cause and pathogenesis of the aneurysmal bone cyst are poorly understood. Several investigators have proposed that aneurysmal bone cyst arises from a **traumatic event.** Others have suggested that aneurysmal bone cyst and giant cell granuloma are closely related. It is likely that the aneurysmal bone cyst may occur either as a primary lesion or as a result of disrupted vascular dynamics in a preexisting intrabony lesion.

Clinical and Radiographic Features

Gnathic aneurysmal bone cysts are uncommon, with approximately 2% reported from the jaws. Within the jaws, a wide age range is noted, but most cases arise in children and young adults with an approximate mean age of 20 years. No significant sex predilection is noted. A mandibular predominance is noted, and the vast majority arises in the posterior segments of the jaws.

The most common clinical manifestation is a swelling that has usually developed rapidly. Pain often is reported; paresthesia are rarely seen. On occasion, malocclusion, mobility, migration, or resorption of involved teeth may be present. Maxillary lesions often bulge into the adjacent tissue; nasal obstruction, nasal bleeding, proptosis, and diplopia are noted uncommonly.

Radiographically:

It shows a unilocular or multilocularradiolucent lesion often associated with marked cortical expansion and thinning. The radiographic borders are variable and may be well defined or diffuse. Frequently, a ballooning or "blow-out" distention of the contour of the affected bone is described .

At the time of surgery, intact periosteum and a thin shell of bone are typically found covering the lesion. When the periosteum and bony shell are removed, dark venous blood frequently wells up and venous like bleeding may be encountered. The appearance at surgery has been likened to that of a "blood-soaked sponge."

Histopathologic Features

Microscopically, the aneurysmal bone cyst is characterized by spaces of varying size, filled with unclotted blood surrounded by cellular fibroblastic tissue containing multinucleated giant cells and trabeculae of osteoid and woven bone.

The blood-filled spaces are not lined by endothelium. In approximately 20% of the cases, aneurysmal bone cyst is associated with another pathosis, most commonly a fibro-osseous lesion or giant cell granuloma.

Treatment and Prognosis

Aneurysmal bone cysts of the jaws are usually treated by curettage or enucleation, sometimes supplemented with cryosurgery. The vascularity of gnathic lesions is typically low flow, and removal of the bulk of the lesion is usually sufficient to control the bleeding. Rare cases require more extensive surgical resection grafting.

The reported recurrence rates are from8% - 60%. Mostly arise from inadequate or subtotal removal upon initial therapy. In spite of recurrences, the long-term prognosis appears favorable.

Hyperparathyroidism(metabolic bone disease)

Excess production of parathyroid hormone (PTH) results in the condition known as hyperparathyroidism. PTH normally is produced by the parathyroid glands in response to a decrease in serum calcium levels.

Hyperparathyroidism may be one of three types: **primary**, **secondary** and **hereditary** , *Primaryhyperparathyroidism*: is characterized by hyprersecretion of parathyroid hormone from hyperplastic parathyroid gland,parathyroid adenoma or an adenocarcinoma.

Secondary hyperparathyroidism develops when PTH is continuously produced in response to chronic low levels of serum calcium, a situation usually associated with **chronic renal disease**. The kidney processes vitamin D. which is necessary for calcium absorption from the gut, therefore in a patient with chronic renal disease, active vitamin D is not produced and less calcium is absorbed from the gut, resulting in lowered serum calcium levels.

Hereditaryhyperparathyroidism has been shown to be autosomal dominant condition

Clinical and Radiographic Features

The incidence increase with age ,and is greater in menopausal women. Early symptoms include, fatigue, weakness, arrythemias, polyuria, bone pain and headache.

Radiographically:

In the jaw bones,osteoporotic appearance of the mandible and maxilla showing well-demarcated unilocular or multilocular radiolucencies reflecting ageneralized resorption(ground glass appearance), overall cortical thinning loss of the lamina dura surrounding the roots of the teeth is also seen.longstanding lesions may produce significant cortical expansion.With persistent disease, other osseous lesions develop, such as the so-called brown tumor of hyperparathyroidism. This lesion derives its name from the color of the tissue specimen. which is usually a dark reddish-brown because of the abundant hemorrhage and hemosiderin deposition within the tumor.

Histopathologic Features:

Bone lesions of hyperparathyroidism although non -specific, are important in establishing diagnosis. Bone trabeculae show osteoclastic resorption .

The brown tumor of hyperparathyroidism is histopathologically identical to the central giant cell granuloma of the jaws. Both lesions are characterized by a proliferation of exceedingly vascular granulation tissue, which serves as a background for numerous multinucleated osteoclast- type giant cells. Accummulation of hemosiderin and extravasated RBCs,as a result the tissue may appear reddish brown accounting for the term**(brown tumor).**

Diagnosis:

Brown tumor of hyperparathyroidism is clinically **,**radiographically and histopathologically similar to central giant cell granuloma, therefore ,a bone chemistry profiling should reveal elevation of serum parathyroid hormone (PTH),serum calcium and alkaline phosphatase, with decrease of phosphorus.

Treatment and Prognosis

After diagnosis of hyperparathyroidism the patient should be referred to a surgeon for excision of the parathyroid glandor for kidney function evaluation.The jaw lesion should resolve after treatment.

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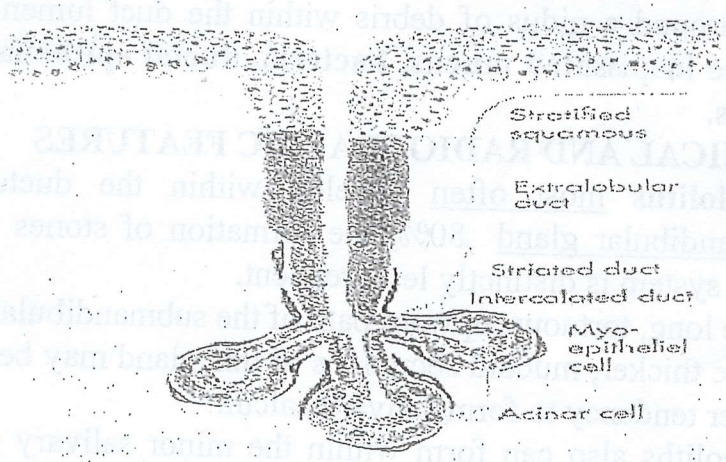
ORAL PATHOLOGY

Salivary gland diseases and tumors

Salivary glands are tubulo-acinar exocrine organs responsible for the production and secretion of saliva. They comprise three-pairs of major glands (the parotid, submandibular, and sublingual).There are also several hundred minor glands, which are widely distributed throughout the oral and oropharyngeal submucosa, and in some cases, the underlying muscle.

The functional unit of salivary glands is the secretory acinus and related ducts and myoepithelial cells. Acini may be serous, mucous, or mixed.

Parotid gland :(Stenson's duct) Opens into the oral cavity on the buccal mucosa opposite the maxillary second molar. (Pure serous)
Sub mandibular gland: (Wharton's duct) Opens at the sub lingual area, marked by small papilla at the side of the lingual frenum on the floor of the mouth. (Mixed gland mainly serous with mucous)
Sub lingual gland: (Bartholin's duct) lies between the floor of the mouth & the mylohyoid muscles.Opens near the sub mandibular gland. It is also a mixed gland (mainly mucous with serous)



Normal function & health of the mouth depend on normal secretion of the saliva by the major & minor salivary glands. Failure of salivary secretion causes a dry mouth which promotes oral infections. The most important function of S.G. is the production of saliva which contains various organic & inorganic substances & help in the mastication, deglutition & digestion of food.

INVESTIGATIVE METHODS

Sialometry: measures the amount of saliva produced in a certain time
Sialochemistry: measures the composition of the saliva
Sialography: by introducing iodine-containing contrast medium through the opening of the duct
Scintigraphy: using radioisotope
Sonography
Cytology
Biopsy

Classification of the salivary gland diseases:

1. **Obstruction:** Calculi Cystic
2. **Infection & inflammation:**
   Bacterial acute bacterial sialadenitis
   chronic bacterial sialadenitis
   Viral mumps
3. **Degenerative diseases:** radiation, Sjogren's syndrome.
4. **Functional disorders.**
5. **Neoplasms** (benign and malignant).

Salivary calculi (sialoliths)

Sialoliths are calcified structures that develop within the salivary ductal system. Researchers believe that they arise from deposition of calcium salts around a nidus of debris within the duct lumen. This debris may include **inspissated mucus, bacteria, ductal epithelial cells, or foreign bodies.**

CLINICAL AND RADIOGRAPHIC FEATURES

Sialoliths most often develop within the ductal system of the submandibular gland 80%; the formation of stones within the parotid gland system is distinctly less frequent.

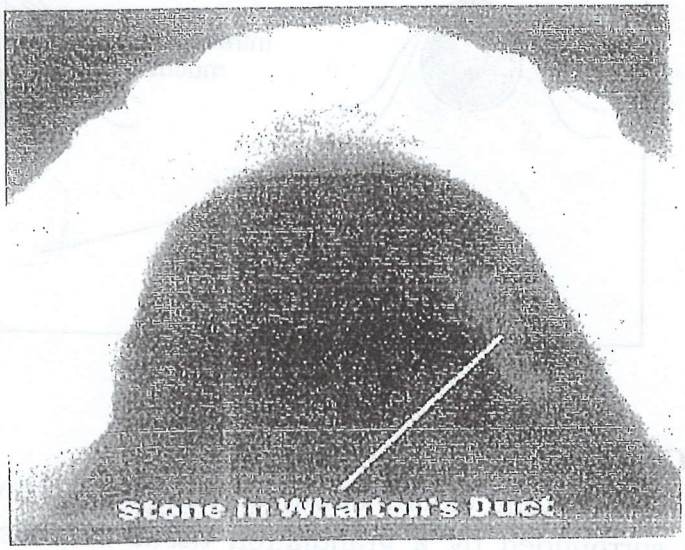
1-The long, tortuous, upward path of the submandibular (Wharton's) duct
2- The thicker, mucoid secretions of this gland may be responsible for its greater tendency to form salivary calculi.

Sialoliths also can form within the minor salivary glands, most often within the glands of the upper lip or buccal mucosa. Salivary stones can occur at almost any age, but they are most common in young and middle-aged adults. Major gland sialoliths most frequently cause episodic pain or swelling of the affected gland, especially at mealtime. The severity of the symptoms varies, depending on the degree of obstruction and the amount of resultant backpressure produced within the gland.Minor gland sialoliths often are asymptomatic but may produce local swelling or tenderness of the affected gland.

Sialolithiasis. Sialoliths obstruct the flow of mucin as they slowly enlarge.

Sialoliths typically appear as radiopaque masses on radiographic examination. ; However, not all stones are visible on standard radiographs (perhaps because of the degree of calcification of some lesions). They may be discovered anywhere along the length of the duct or within the gland itself.

Plain occlusal film is diagnostic, and effective for intraductal stones, while intraglandular, radiolucent or small stones may be missed. About 40% of the parotid & 20% of the sub mandibular stones are not radio opaque & sialography may be needed to locate them.



MUCOUS RETENTION AND EXTRAVASATION CYSTS

Extravasation: is the leakage of fluid from the ducts or acini into the surrounding tissue. Extra: outside, vasa: vessel

Retention: narrowed ductal opening that cannot adequately accommodate the exit of saliva produced, leading to ductal dilation and surface swelling. Less common phenomenon

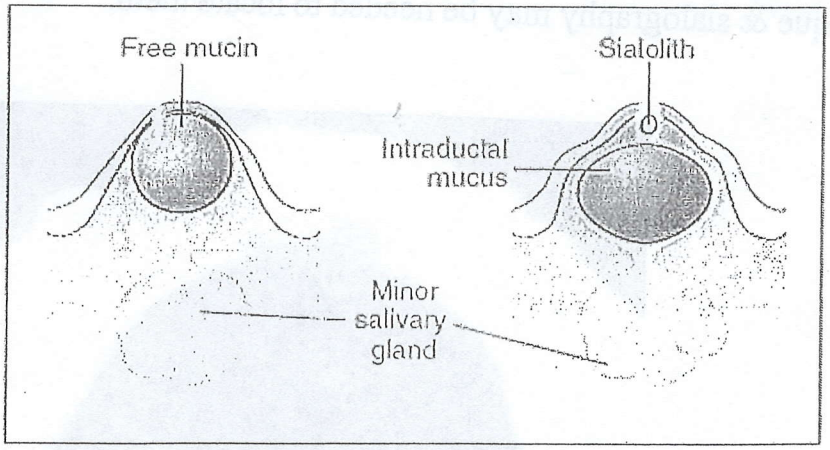
Mucoceles (**Muco**: mucus, coele: cavity)

Exclusive of the irritation fibroma, Mucoceles, are most common of the benign soft tissue masses in the oral cavity.

When a mucoceles occur in the floor of the mouth, they are called (**Ranula**)

Mucoceles consist of a circumscribed cavity in the connective tissue and submucosa producing an obvious elevation in the mucosa. The majority of the mucoceles result from an extravasation of fluid into the surrounding tissue after traumatic break in the continuity of their ducts. They are not true cysts because they lack a true epithelial lining.

Clinically Typically present as soft fluctuant bluish or translucent swelling that can vary in size from few mm to several cm. All age groups are affected, but most frequently in children & young adults. Mainly affect the minor salivary glands of the lower lip but may be seen on the buccal mucosa, floor of the mouth, palate, upper lip & tongue.



HISTOPATHOLOGIC FEATURES

On microscopic examination, the mucocele shows an area of spilled mucin surrounded by a granulation tissue response. The inflammation usually includes numerous foamy histiocytes (macrophages). In some cases a ruptured salivary duct may be identified feeding into the area. The adjacent minor salivary glands often contain a chronic inflammatory cell infiltrate and dilated ducts.

Ranula: Rana-frog (Latin)

Is a large mucoceles in the lateral aspect of the floor of the mouth arising from a blocked sub lingual gland duct. It is located lateral to the midline, helping to distinguish it from a midline dermoid cyst. It is so called because of a clinical resemblance to the belly of the frog. The name is derived from the word rana, because the swelling may resemble the translucent underbelly of the frog.

Clinically They are soft, fluctuant & bluish, Presents as a blue dome shaped swelling in the floor of mouth (FOM). They tend to be larger than mucoceles & can fill the FOM & elevate tongue. They are typically painless but may interfere with speech or mastication because it causes pushing of the tongue up toward the palate.

Microscopically:-

The microscopic appearance of a ranula is similar to that of a mucocele in other locations. The spilled mucin elicits a granulation tissue response that typically contains foamy histiocytes.

Treatment

Is surgical, by total or partial removal or by marsupialization. Although the source is usually the sublingual gland, it may also arise from the submandibular duct or possibly the minor salivary glands in the floor of the mouth.

Salivary Gland Infections

Sialadenitis

Inflammation of the salivary glands **(sialadenitis)** can arise from various infectious and non- infectious causes. The most common viral infection is **mumps**, although a number of other viruses also can involve the salivary glands.

Most bacterial infections arise as a result of **ductal obstruction** or **decreased salivary flow**, allowing retrograde spread of bacteria throughout the ductal system.

Blockage of the duct can be caused by **sialolithiasis, congenital strictures, or compression by an adjacent tumor.**

Decreased flow can result from **dehydration, debilitation, or medications that inhibit secretions.**

Bacterial sialadenitis

Acute bacterial sialadenitis is most common in the parotid gland and is bilateral in 10% to 25% of cases. The main organisms involved being **Streptococcus pyogenes** and **staphylococcus aureus.**

Clinically

1- The affected gland is swollen and painful

2- The overlying skin may be warm and erythematous.
3- An associated low-grade fever and trismus may be present.
4- A purulent discharge often is observed from the duct orifice when the gland is massaged.

Chronic sialadenitis

Recurrent or persistent ductal obstruction (most commonly caused by sialoliths) can lead to a chronic sialadenitis. Periodic swelling and pain occur within the affected gland, usually developing at mealtime when salivary flow is stimulated. Sialography often demonstrates sialectasia (ductal dilatation) proximal to the area of obstruction.

Chronic sialadenitis also can occur in the minor glands, possibly as a result of blockage of ductal flow or local trauma.

TREATMENT AND PROGNOSIS

The treatment of acute sialadenitis includes appropriate antibiotic therapy and rehydration of the patient to stimulate salivary flow. Surgical drainage may be needed if there is abscess formation. Although this regimen is usually sufficient, a 20% to 50% mortality rate has been reported in debilitated patients because of the spread of the infection and sepsis.

The management of chronic sialadenitis depends on the severity of the condition and ranges from conservative therapy (sialogogues, massage and antibiotics for acute exacerbations), to surgical intervention.

Viral sialadenitis

Mumps :

Mumps is an acute contagious disease , occurs in minor endemics caused by paramyxo virus. It is the commonest of all salivary gland diseases.

The virus can be transmitted by direct contact with infected saliva and by droplets spread, and the incubation period is of about 21 days. Although any age can be affected is most common in childhood .

Usually affecting the parotid gland bilaterally. The sub mandibular & sub lingual glands may also be affected.

1- The infection starts with non- specific prodromal symptoms, fever and malaise
2- Followed by a painful swelling behind the ear,
3-the papilla of parotid (Stenson's) duct may be swollen
4- Secretion of the parotid is less so the mouth may be dry.
5- The pain subsides but the swelling persist for 7 days &then decrease .

Permanent nerve deafness & meningitis are possible complications. In adult males, as a complication of mumps **orchitis** may develop.After

attack immunity is long lasting, with wide use of immunization childhood mumps is becoming infrequent.

TREATMENT AND PROGNOSIS

The treatment is palliative in nature. Frequently, non aspirin analgesics and antipyretics are administered. In an attempt to minimize orchitis, bed rest is recommended for males until the fever breaks. Avoidance of sour foods and drinks helps to decrease the salivary gland discomfort. As with measles and rubella, the best results come from prior vaccination, thereby preventing the infection.

Sjogren's syndrome:

It is a chronic autoimmune disease characterized by lymphocytic infiltration and acinar destruction of salivary and lacrimal glands leading to dry eye and dry mouth. In about half of the cases there is an association with another autoimmune disease, most frequently rheumatoid arthritis or SLE.

Clinical features:

1-Occur predominantly in middle-aged women.

2-Dryness of the mouth & eyes as a result of hypofunction of the salivary & lacrimal glands.

3-The oral mucosa is obviously dry, red, shiny & wrinkled & sticks to the fingers or mirror during examination.

4-The tongue appears red, atrophy of the papillae & the dorsum becomes lobulated.

5-xerostomiamay be associated with swallowing and speaking, increased fluid intake and disturbance of taste

6-With diminished saliva secretion the candidal infections, bacterial sialadenitis and dental caries are common.

Treatment:

The treatment of patient with Sjogren's syndrome is mostly supportive.

1. Periodic use of artificial tears for the dry eye.
2. Artificial saliva for xerostomia
3. Because of increased risk of dental caries, daily fluoride application may be indicated in dentulous patients
4. Also antifungal therapy is often needed to treat secondary candidiasis.

Malignant lymphoma can develop in Sjogren's syndrome.

Salivary Gland Tumors

Tumors of the salivary glands constitute an important area in the field of oral and maxillofacial pathology. Although such tumors are uncommon, they are by no means rare.

Pleomorphic adenoma (benign mixed tumor)

Is a benign tumor which is the commonest of all salivary gland tumors, it accounts for about 75% of parotid gland tumors. The origin of this tumor is thought to be from the myoepithelial cells and the duct epithelium ..

Clinically:

The most common site is the **parotid gland**, typically present as a painless swelling, slowly growing reaching to several cm, there is no fixation to the deeper tissue or to the overlying skin, and the skin is rarely ulcerated. The lesion can occur at any age but is most common in young adults between the age of 30&50 years. There is a slight female predilection.

Pleomorphic adenoma is also the most **common intraoral** salivary gland tumor, its usual location is the **palate**, when it presents as a smooth surface swelling resembling a fibroma, and the **upper lip** is the next common site.

Histopathological features:

A pleomorphic adenoma is a circumscribed encapsulated tumor characterized by its pleomorphic appearance. The capsule may be incomplete and show infiltration by tumor cells.

The lesion shows a great variation in appearance, hence the term pleomorphic

1. Cuboidal cells arranged in tubes or duct like structure which may contain an eosinophilic coagulum.
2. The tumor epithelial cells may be arranged in sheets or strands about these tubular structures. Some time the cells may assume a stellate, polyhydral or spindle form.
3. Squamous epithelial cells are relatively common & there may be keratin pearls.
4. Loose myxoid material can be seen.
5. The hyaline, mucoid, cartilage or even bone is a common finding.

Treatment:

1- In the **parotid gland,** wide excision, the tumor & the involved lobe should be removed; recurrent rate in this position is high because of difficult surgical complete removal of tumors from the parotid, where the facial nerve is present. The recurrence rate is low in skilled hands.

2- In the **submandibular gland,** tumor is removed with the whole gland because of risk of malignancy.

3- Lesion of the **minor salivary gland of the palate** should be excised with the overlying mucosa, while those in the **lip, soft palate & buccal mucosa** treated successfully by encapsulation.

Benign pleomorphic adenoma may undergo malignant changes either to a carcinoma, adenocarcinoma or cylindroma..

Malignant tumors of salivary gland

Malignant tumors of salivary glands are relatively uncommon, accounting for about 1 % or less of all malignancies and about 5% percent of malignant tumors in the head and neck region.

Mucoepidermoid carcinoma

The **mucoepidermoid carcinoma** is one of the most common salivary gland malignancies.

Clinical features

The tumor occurs fairly evenly over a wide age range, extending from the second to seventh decades of life, rarely is it seen in the first decade of life. The mucoepidermoid carcinoma is the most common in the parotid gland and usually appears as an asymptomatic swelling. Pain or facial nerve palsy may develop, usually in association with high-grade tumors

Minor gland tumors Appear as asymptomatic swellings, which are sometimes fluctuant and have a blue or red color that can be mistaken clinically for a mucocele .The palate is the common site of involvement. The lower lip, floor of mouth, tongue, and retromolar pad areas are uncommon locations for salivary gland neoplasia.

Histopathological features:

From its name the mucoepidermoid CA is composed of a mixture of **mucous -producing cells** and **epidermoid or squamous cells.**

If the mucous – secreting cells are mainly predominant then the tumor tend to be **cystic**, if mainly epidermoid the tumor is **solid** and then more aggressive. There is no well-defined capsule, and it is invasive and occasionally metastasising.

Traditionally, mucoepidermoid carcinomas have been categorized into one of three **histopathologic grades** based on the following:

1. Amount of cyst formation
2. Degree of cytologic atypia
3. Relative numbers of mucous, epidermoid, and intermediate cells**

Low-grade tumors show prominent cyst formation, minimal cellular atypia, and a relatively high proportion of mucous cells.

High-grade tumors consist of solid islands of squamous and intermediate cells, which can demonstrate considerable pleomorphism and mitotic activity. Mucus-producing cells may be infrequent, and the

** intermediate cells: are undifferentiated cells that can form mucous and epithelial cells.

tumor sometimes can be difficult to distinguish from squamous cell carcinoma.

Intermediate-grade tumors show features that fall between those of the low-grade and high-grade neoplasms.

Treatment: is by wide excision but the tumor may recur

ADENOID CYSTIC CARCINOMA

The adenoid cystic carcinoma is one of the more common and best-recognized salivary malignancies.It usually grows slowly but usually shows distinct infiltrative spread.

The tumor cells are of two types, duct lining cells and cells of myoepithelial type. It occurs most frequently in the minor salivary gland of the palate. The parotid, submandibular and accessory glands in the tongue are also involved.

The lesion is most common in middle –aged adult with equal sex distribution. It present as slowly growing mass, there is early local pain, facial paralysis may develop with parotid tumors; palatal tumors can be smooth- surfaced or ulceration and may show radiographic evidence of bone destruction.

Histopathology:

1. Composed of small, deeply staining uniform cells resemble basal cells, which are commonly arranged in anastamosing cords or duct like pattern with mucoid material in the center. This produce a typical cribriform (honey comb or Swiss cheese appearance). pattern
2. In the tubular pattern, the tumor cells are similar but occur as multiple small ducts or tubules within a hyalinized stroma.
3. The solid form consist of larger islands or sheets of tumor cells which show little tendency toward duct or cyst formation.

Treatment:

Is surgical removal with radiation. Metastasis occurs late in the course of the disease.